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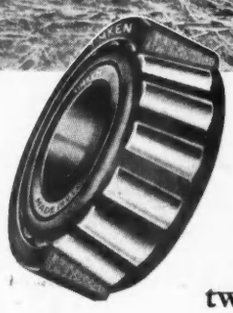
AUTOMOTIVE and Aviation INDUSTRIES

APRIL 1, 1946

ROLLING ON 128 TIMKEN BEARINGS



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TIMKEN
TRADE-MARK REG. U. S. PAT. OFF.
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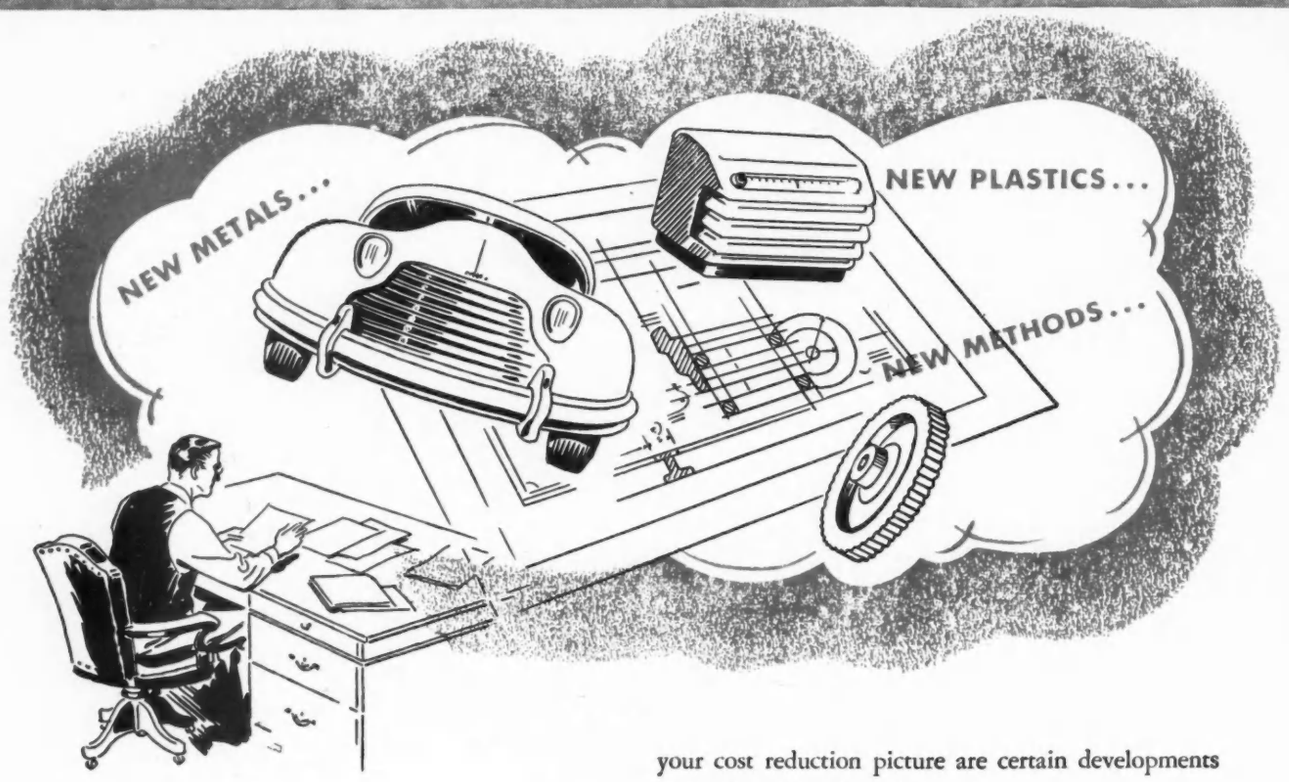

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YOU HAVE undoubtedly been figuring out ways of cutting costs and improving your products through war-developed methods and materials. New metals, as well as new plastics and other synthetics, offer remarkable opportunities.

Less spectacular but perhaps just as important in your cost reduction picture are certain developments in cutting oils and coolants.

Many of these products were entirely unknown before the war. They are as new as radar. Others are improvements of established products. All provide better finish, longer tool life, higher rate of production, or other improvements that affect costs of machined parts.

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AUTOMOTIVE and Aviation INDUSTRIES

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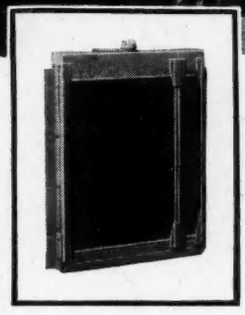

The specially designed vehicles for the Canadian Government's famous trek into the Arctic wastelands are Young-equipped. They employ a sturdy, soldered sheet metal "double-duty" radiator . . . capable of taking the punishment of severe weather, rugged terrain and gruelling operation. Small core section is a torque convertor oil cooler; the main core cools engine jacket liquid.

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TUNE IN THE TEXACO STAR THEATRE WITH JAMES MELTON EVERY SUNDAY NIGHT — CBS

SPOTLIGHTS
on the General Motors Strike

An Analysis of the New Contract

By Leonard Westrate

AN ANALYSIS of the new General Motors contract with the UAW-CIO shows that it was unquestionably not the victory for the union that Walter Ruether and other CIO heads claimed. Looking back to the beginning of the strike, it is apparent that most of the demands made by the union were either defeated outright or heavily modified. For example, the 30 per cent pay increase demanded was eventually settled for about half the original demand. The issues of ability to pay, a look at the books, elimination of geographical wage differentials, a commitment by GM that wage increases would not result in price increases for its products. and use of 3 per cent of the increase for a social security fund to provide death and other insurance benefits, were soundly defeated.

The new contract consists largely of the previous contract, which was cancelled December 10 and then reinstated with the following changes:

Wages: A general pay raise of 18½ cents an hour for all hourly-rated workers in plants with UAW contracts. This increases the company-wide average to approximately $1.31 cents per hour. The previous contract clause providing that establishment of scales for each operation is a matter for local determination in accordance with levels in the community, among other things, still remains in effect. The company agreed to re-examine all cases of alleged wage inequities at local plants within 90 days. This clause is considered by labor observers as a likely source of disputes and subsequent grievances. The agreement also calls for retroactive pay of 13½ cents an hour for all time worked between last Nov. 7 and date of ratification.

Check-off: Maintenance of membership, ordered by the War Labor Board March 3, 945, is thrown out and is replaced by a check-off of dues and assessments. GM made a determined fight on this point. The company was compelled to discharge hundreds of valuable employees under maintenance of membership and scored a signal victory in having it written out of the contract. An escape period is provided during which employees may have their names removed from the UAW membership list. After that time the checkoff will operate against all names on the list and will continue without revocation for the life of the contract.

Vacation pay: Formerly workers with one year of seniority were given a vacation pay allowance of $45, and those with five or more years, $90. Under the new agreement, one to three year men will receive 2 per

(*Turn to next page, please*)

The Position of General Motors

By Harry W. Anderson
Vice President,
General Motors Corp.

ON DECEMBER 6, 1945, General Motors offered the UAW a general wage increase totaling 13½ cents an hour. At that time, the 1945 agreement was still in effect. The wage offer was the maximum amount which could then be made, under the then existing policy of the Government.

This offer would have permitted the re-opening of the wage issue

(Based on the transcript of the press conference held March 2 to explain the Corporation's position at that time.)

April 28, 1946, which was the expiration date of our 1945 contract.

On February 15, 1946, the UAW leaders admitted that they could not accept the offer because Philip Murray, CIO president, though it would hurt the position of the Steelworker's Union, which had contracts expiring at a later date than ours. Walter Reuther in rejecting the 13½ cent offer, said, "I talked to Phil Murray, who said that if we

(*Turn to next page at right*)

An Analysis of the New Contract

(*Continued from the preceding page*)

cent of gross annual earnings, those with three to five years seniority will receive 3 per cent of gross earnings, and those with five or more years 4½ per cent. This is a more liberal allowance, especially in view of the increased annual earnings contemplated from higher wage rates and considerable overtime in the period ahead.

Overtime pay: Double time will be paid for hours worked on a seventh consecutive day of a calendar week on continuous operations when such seventh day customarily is a day off. Previously only time and one-half was paid for such work.

Transfers and promotions: Outside of the wage question, this famous "Paragraph 63" was the most bitterly contested provision in the entire negotiations. The promotion part of the clause remains as it was previously, with advancement to a higher paid job, when ability, merit, and capacity are equal, going to employes with the greatest seniority. However, negotiations snagged on union insistence that seniority govern transfer of employes. Under the union demand, employes within a department would have the right to select any job they chose and "bump" a man of lesser seniority to get it. They also would have the right to refuse a more undesirable job, even though of equal pay, if men of lower seniority were available to take the job. GM made a stonewall stand against that demand, and the agreement finally reached provides that the transfer of employes is the sole responsibility of management, subject to the following:

"It is the policy of management to cooperate in every practical way with employes who desire transfers to new positions or vacancies in their department. Such employes who make application . . . stating their desires, qualifications, and experience will be given preference for openings in their department, provided they are capable of doing the job. However, employes who have made application as provided for above and who are capable of doing the job available shall be given preference over new hires. Any secondary job openings resulting from filling jobs pursuant to this provision may be filled through promotion; or through transfer without regard to seniority standing, or by new hire."

Although the insertion of the above provision was claimed by the union as a victory, careful reading shows that it is nothing of the sort. The clause does not mention seniority in connection with transfers out of the department. Nowhere does it say that seniority is to be the basis for making transfers within a department. It states that employes who have made application as outlined will have preference for job openings. It makes no commitment that if several applicants of equal ability have applied that seniority will govern the choice. Neither does it provide that men with higher seniority may "bump" another worker or refuse to take a job of equal classification. A GM spokesman says that the company intends to follow generally its past practice of giving preference to older employes in

(*Turn to page* 67, *please*)

Two Ends of

August 18. On that date the UAW-CIO sent its demands to General Motors for a 30 per cent wage increase—or else.

On **November 1** the U. S. Department of Commerce released its (?) report (dated October 25) on the automobile industry's profits and ability to pay, in which it stated that "Under the high level operations which the automobile industry will experience over the next few years, it can grant a substantial wage increase and make high profits. . . . It is apparent that present cost-price relationships are such throughout industry that a basic wage increase is possible without raising prices." On the following **February 6** the Department of Commerce issued a supplement to the first report.

October 26, six days before the Department of Commerce released its first report, and 103 days before the supplementary report, the UAW-CIO issued a "Purchasing Power for Prosperity" brief to General Motors to support its demands for "a 30 per cent increase in present scheduled hourly wage rates in order to maintain take-home pay without any increase in the prices of General Motors products. . . ." In this UAW-CIO brief appeared some statistics and quotations from the Department of Commerce reports which had not been released at that time and which the UAW-CIO brief stated had been completed before V-J day (August 15). Here is the evidence from "Purchasing Power for Prosperity" of **October 26**:

Appendix Three
(Pages 73 and 74)
Department of Commerce Report on Ability of Automobile Industry to Pay Higher Wages

This report of the Bureau of Foreign and Domestic Commerce of the U. S. Dept. of Commerce, released November 1, 1945, analyzes the peacetime record of the automobile industry to ascertain the probable effect of volume of output, prices, wages and other factors upon profits during postwar years.

It says, "Under the high level of operations which the automobile industry will experience over the next few years, it can grant a substantial wage increase and make high profits.

"It is apparent that present cost-price relationships are such throughout industry that a basic wage increase is possible without raising prices.

"For 1946, a general increase of 10 per cent is possible.

"Such an average would mean a rise of 15 per cent or a little more in the manufacturing industries. Some industries could afford more, some not so much.

"The automobile industry is in the former class—15 per cent can be granted without adverse results in the first prewar* year of restricted operations, and a further increase of 10 per cent can be given for 1947 when production will have reached peak rates.

"A much higher wage income will have to be secured if demand is to be sufficient to produce full employment by 1948."

---

* Prewar was also printed by error in the Department of Commerce report. Postwar obviously intended.—Ed.

Further evidence that the Department of Commerce and UAW-

The Position of General Motors

(*Continued from the second preceding page*)

accepted before our agreement expired, it would have set the pattern, and Steel would have had to take it, too, because their contract did not expire until October." He said we would have put him in an embarrassing position, because by that time, 13½ cents would have become the pattern for the country. So if you want to know about free collective bargaining in good faith, you can see where we were at that time, trying to make an offer.

We have had very little difficulty in resolving the local issues under the agreements which have been in effect for the past several years. Many of these local demands duplicated those made for all plants by the International Union, such as the demand for the 30 per cent general wage increase. We didn't know whether it was 30 per cent in addition to the first 30 per cent, but anyway that demand was made in 21 plants.

Many of the other demands were also of an economic nature, or such that would detract from the efficiency of the operation of the plant.

The local shop committees made 846 separate demands on the local managements, in the plants where the UAW is the bargaining agent. These demands divide themselves into six general groups:

71 demands duplicate those made on General Motors by the International Union.

109 demands deemed proper for local negotiation.

143 demands which, if granted, would result in a reduction in the efficiency of the operation of our plants.

79 demands designed to restrict the maintenance of discipline, and therefore the plant efficiency of our plants, which in turn would result in increased costs.

128 demands which would definitely add to the cost of doing business.

311 miscellaneous demands.

Five hundred meetings were held on these demands, to resolve the issues, after the strike started or shortly before. These were strictly local plant bargaining meetings and the demands vary by plants in numbers. Some of them have as many as 30 or 40 demands, others have four or five, so it covers all of our various operations in our plants that are represented by the UAW.

On February 18 these were the union points: Maintenance of membership, paragraph 63 (dealing with promotions and transfers), local issues, vacation pay, reinstatement of the local agreements that were automatically cancelled at the time we cancelled the main agreement, the successor clause, the miscellaneous units, and a letter regarding no discrimination for striking. and the FEPC. They wanted to get the FEPC in there. We wanted to know whether that was for the purposes of the PAC or not.

On the corporation points. we were talking about provisions permitting the scheduling of overtime. no resistance to technological improvements, no interference with production standards (slowdowns); no strikes during the life of the agreement, provision regarding scurrilous attacks, a floater period, and removing objections of incentive

(*Turn to page* 67, *please*)

a Pipeline

CIO collaborated in the preparation of their reports is supported by the following:

(1) That these reports were prepared by the same persons or by persons collaborating is indicated by the fact that both the Department of Commerce and the UAW-CIO present a "motor vehicle price index 1936-39 = 100," which both claim was prepared by the U. S. Bureau of Labor Statistics. The fact is that that agency has not published a price index on the 1936-39 base. The actual BLS index, which is on a 1926 base, when carefully adjusted to a 1936-39 base shows four small errors in the Department of Commerce figures and identical errors in the UAW-CIO figures.

(2) Both reports show an identical raw material price index constructed specially for these analyses by combining 42 price series in a complicated manner. This index has not been published anywhere else. Its construction involves identical intricate weighting, imputing, and lagging procedures that could hardly have been duplicated by coincidence. Amusingly enough, both the UAW and the Department of Commerce make an identical error in reporting that the 1939 Census material they used came from pages 524-526, when in reality it came from page 527. Pages 524-526 actually show no figures relevant to the problem.

(3) Both make identical errors by allocating inter-company sales from Federal Trade Commission figures. The report of the FTC specificallly warns against this procedure on page 527 of its Motor Vehicle Industry Report.

(4) Both present a special computation prepared in the same way showing the effect on material costs of the variation in "product mix." In both cases this irrelevant computation is not necessary to, nor used in, the final computation or conclusions.

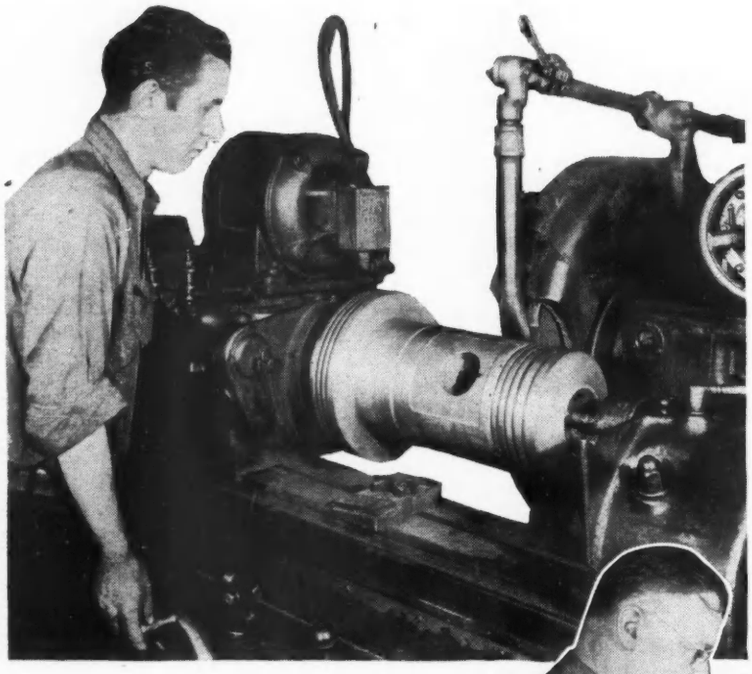
On November 8, in reply to a letter from George Romney, general manager of the Automobile Manufacturers Association, who disputed the conclusions in the November 1 report, Secretary of Commerce Henry Wallace upheld the report, stating that the study was prepared by able statisticians who analyzed all available data, and that it had been in preparation since early in the year.

November 21—The General Motors strike begins.

(*Turn to page* 68, *please*)

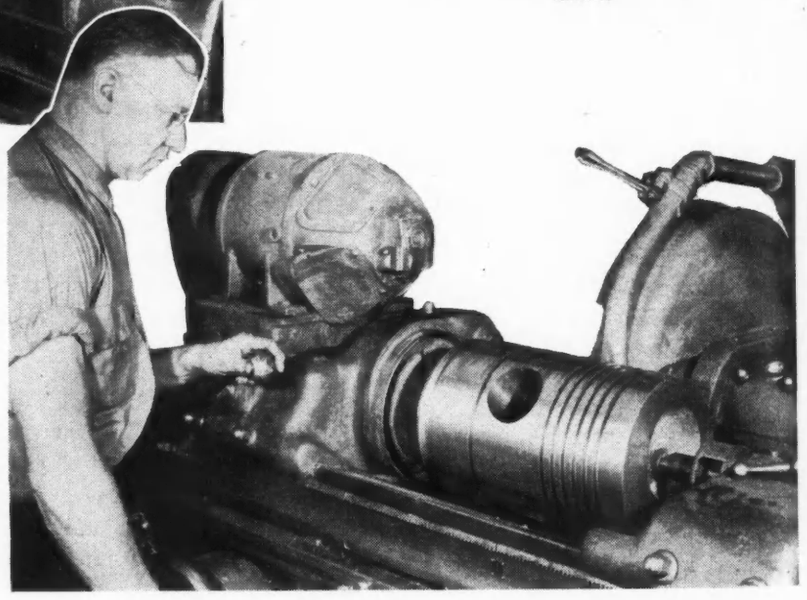
How the Ohio Piston Company Produces

Pistons Up



(Left) Latest type Landis 14 in. by 36 in. external grinder for finish grinding the OD of large pistons, the one shown here being a special two-diameter Diesel engine piston. The grinder is fitted with live center heads and hydraulic feeds.

(Below) Originally used for war products, this modern 10 in. by 36 in. Norton external grinder is set up for finishing the OD of large pistons. It is equipped with a special direct current drive.



AN INSTRUCTIVE example of specialization among the parts producers of the industry is to be found at The Ohio Piston Co., Cleveland, designers and producers of pistons since 1918. With an experience spanning the two world wars, the company made an enviable record during World War II as an important manufacturer of pistons and cylinder sleeves for large Diesel engines, many of them for submarine engines for the U. S. Navy.

In a manner typical of parts makers the company presents a versatile setup capable of producing passenger car pistons in large volume for original equipment and the replacement trade on the one hand, and flexible lines for small lot production of cast iron or aluminum pistons in sizes ranging from one in. to 21 in. diameter for compressors and for gasoline and Diesel engines. The replacement pistons of cast iron or aluminum, depending upon original equipment, are distributed through jobbers and company-operated warehouses. Pistons for original equipment are supplied for a variety of uses including—small compressors, heavy duty industrial and marine engines, truck and tractor engines.

Aluminum pistons are produced almost exclusively from Lynite Lo-Ex castings supplied by the Aluminum Co. of America.

For handling economically in a single plant a large variety of products in lots ranging from a few pieces to hundreds of thousands of pieces, The Ohio Piston Co. has found the solution in a departmentalized setup having individual production lines capable of machin-

By Joseph Geschelin

to 12 in. Diameter

In Production and Job Lot Quantities

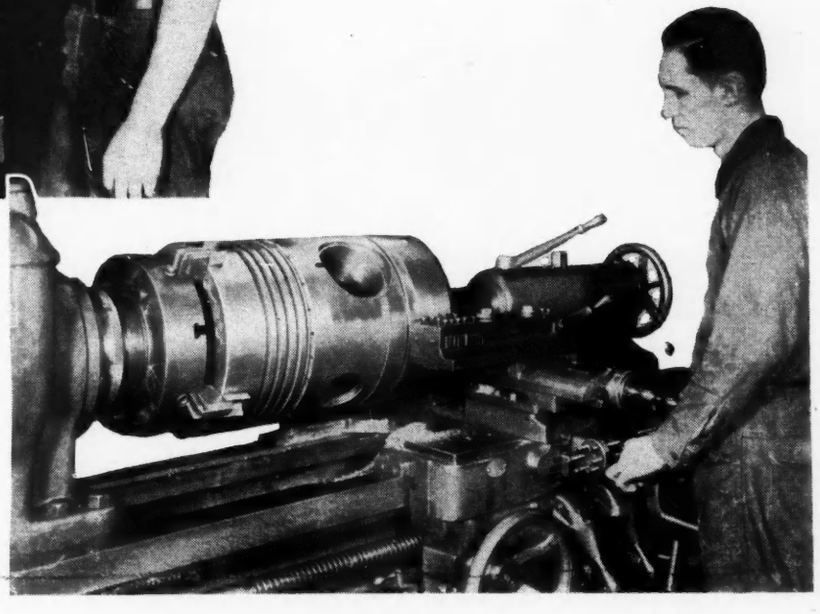
This is the 116th in the series of monthly production features

ing a limited range of sizes. Thus, there is a small line for handling pistons up to two in. in diameter; another for pistons ranging from three to six in. in diameter; one for pistons from six to eight in. in diameter; and another for a range of eight to ten in. in diameter. These lines are tooled specifically for cast iron pistons.

Other lines are tooled exclusively for the high production Lynite pistons for passenger car replacement use. These take, economically, pistons ranging from two to six in. in diameter. A secondary production line for large Diesel engine pistons is flexibly tooled for diameters ranging up to 10 in. in small lots. In addition to these specialized production lines for cast iron and aluminum pistons, there is a small line equipped with large general purpose machinery for spe-

(Above) This is a special two-spindle, three-station vertical automatic cycle milling machine designed by Ohio Piston and built by Cleveland Universal Jig Co. It is used for milling the relief on the piston diameter, eliminating the conventional means for doing this job, and is adjustable for pistons up to 6 in. in diameter.

(Below) This big machine is a 22 in. Lodge & Shipley manufacturing lathe set up for machining large pistons.



cial short run pistons ranging up to 21 in. in diameter.

Know-how acquired over the span of many years has served to establish a standardized procedure for the machining of any kind of piston, with variations stemming from special design features. Invariably the technique is to provide a center in the head concentric with inside diameter, and a well formed chamfer in the open end of the skirt as the centering locations for all succeeding operations. On cast iron pistons, because of the usual runout of the casting, they use a special expanding chuck from the inside of the skirt so as to assure uniform wall thickness. On aluminum permanent mold castings, they chuck directly from the outside surface.

The company has its own tool room and makes the variety of jigs and fixtures, and cutting tools required for each job. It is of interest to find that cemented-carbide tipped tools are used almost exclusively for all operations. Owing to such intensive usage of special tools, they have a special setup for making up and grinding their own cemented-carbide tools, using the latest types of tool room grinding equipment for the purpose. The personnel in this department is thoroughly grounded in the handling of cemented-carbides and is competent to produce tools of any size and form.

At the present writing the company is completing its plant re-arrangement following the war program. During the war it was necessary to concentrate on certain types of pistons urgently required by the Armed Services and, in addition, to make a variety of parts quite foreign to the normal business of the organization. Equipment acquired for such products is now being retooled and fitted into the piston machine lines for peacetime operations, providing, in the process, a means of modernizing the plant setup, and thus offering still further cost economies.

Among the items of new equipment in this category are the following: Fay automatic lathes which will be tooled for turning and grooving; a 22-in. Lodge & Shipley manufacturing lathe for large piston turning; Heald Bore-Matics for precision boring of bushings and wrist pin holes; several Ex-Cell-O double-end precision boring machines for the same purpose; a battery of LeBlond Regal lathes; and large Landis and Norton external grinders suitable for grinding the OD of large pistons.

The trials and tribulations of war production served to bring about some salutary im-

Typical Diesel Cast Iron Production Line for Handling Pistons with Brinell of 310

OPERATION AND EQUIPMENT

Bore and face open end. Center head—**No. 9 Bardons & Oliver turret lathe** with special Ohio Piston design fixtures.

Rough turn OD. Face head and rough groove—**Fay automatic** including special cutting tools of Ohio Piston design to handle cast iron that Brinells at 310.

Special turning operation on diameter required for locating point of the oil control arrangement in the head of the piston; bore, face and ream seat and hole for oil control mechanism in the head—**LeBlond lathe.**

Form combustion chamber on head of the piston—**Potter & Johnston automatic.**

Rough bore pin holes—**Special Foote-Burt four-spindle horizonal boring machine.**

Face clearance between bosses—**Cincinnati-Bickford drill press.**

Precision bore pin hole—**Heald Bore-Matic 46-B, double end double spindle.**

Insert bronze bushings in pin holes—**Cascade Deepfreeze Unit 120 deg. below zero,** providing 0.005 in. to 0.006 in. shrink.

Finish bore pin holes (bushings)—**Heald two-spindle double end 46-B.**

Finish turn for grinding. Finish ring grooves—**Fay automatic.**

Mill relief on piston diameter—Special two-spindle three-station mill.

Drill oil holes in ring grooves—**Avey drill press.**

Grind outside diameter—**Landis or Norton Hydraulic 14 in. by 36 in. grinders.**

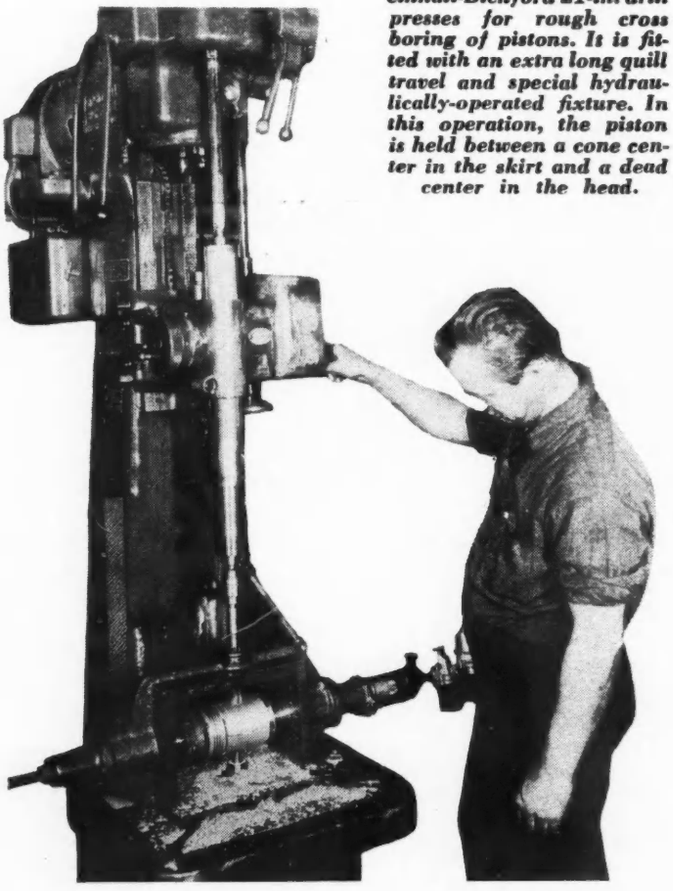
Cut off center boss on head — **Cincinnati-Bickford drill press.**

Drill and tap lifting hole in head—Two-spindle drill press.

Polish concave head—Special polishing machine.

Wash in conveyor type washing machine — **Ransohoff washing machine.**

Clean oil chamber in head with special high pressure air fixture; Inspection; Weight, stamp and number; Tinplate; Final inspection; Rust proof; Pack.



One of a battery of Cincinnati-Bickford 21-in. drill presses for rough cross boring of pistons. It is fitted with an extra long quill travel and special hydraulically-operated fixture. In this operation, the piston is held between a cone center in the skirt and a dead center in the head.

Production Line for Automotive Sizes

OPERATION AND EQUIPMENT

Bore, face and center—**Bardons & Oliver turret lathe** with special Ohio Piston fixture.

Mill horizontal slots—**U. S. hand miller.**

Chamfer open end—**Cincinnati-Bickford drill press.**

Rough cross bore pin hole and bore retainer ring grooves —**Avey drill press.**

Rough and finish grooves. Turn OD—**Fay & Gridley automatics.**

Mill vertical or U Slots—**U. S. hand miller.**

Drill oil holes in ring grooves, drill oil holes in pin bosses, drill holes connecting horizontal or U slots—**Avey high speed drill press.**

Drill and tap set screw hole in pin boss—**Avey two-spindle drill press.**

Chamfer pin hole—**Allen drill press.**

Precision bore pin hole—**Heald Bore-Matic.**

Rechamfer open end—**Cincinnati-Bickford.**

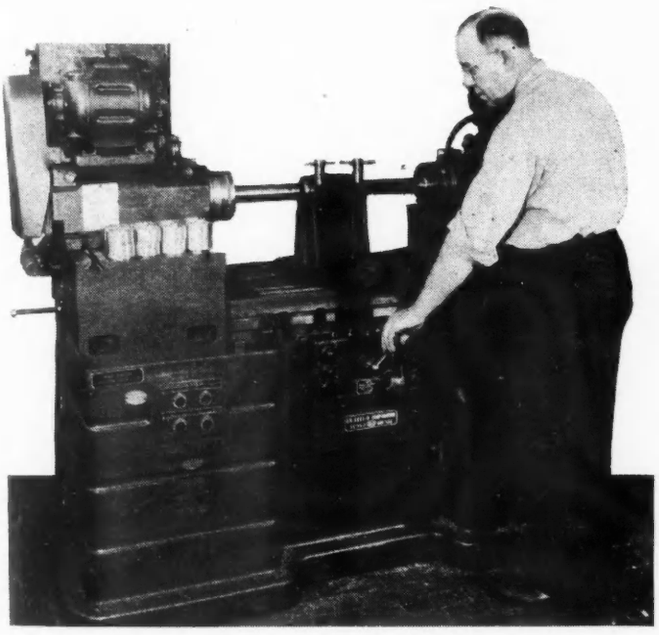
Turn OD for grinding—**LeBlond lathe.**

Cam grind outside diameter—**Landis and Brown & Sharpe 10 in. by 36 in. grinding machines.**

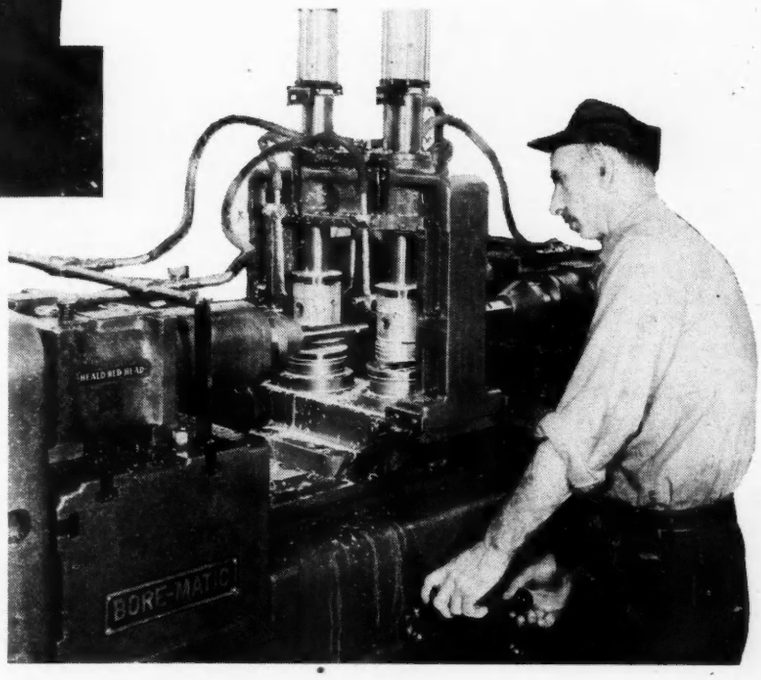
Wash in conveyor-type washing machine — **Ransohoff washing machine.**

Inspection, pack.

(Above) Closeup of a four-spindle, double-end Foote-Burt drilling machine for the rough boring of piston pin holes.

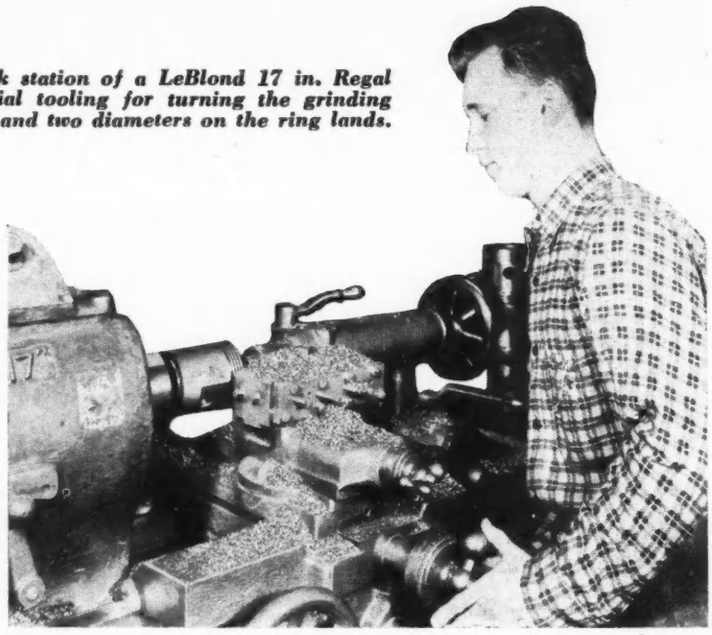


(Left) One of several Ex-Cell-O Model 215A double-end precision boring machines used for a variety of work, including the boring of piston pins. The setup here is for the boring of replacement bushings for marine use with a tolerance for concentricity of plus 0.0005, minus 0.0000 in.



(Right) One of a number of the latest types of Heald Bore-Matics used in this plant for the precision boring of piston pin holes. This machine is a No. 49, four-spindle, double-end type and incorporates a special hydraulic fixture designed by Ohio Piston. It handles the finish-boring of piston holes with a tolerance of plus 0.0000, minus 0.0002 in.

provements in production techniques. Take the case of large pistons as an example. Before the war, the interference fit assembly of large piston pin bushings in the big Diesel pistons was done by heating the piston until the bosses had expanded sufficiently to permit the bushing to slip in. Although the heating cycle took considerable time, the method was satisfactory under prewar conditions when quantities were small and time meant little. However, when production schedules began to accelerate and time was at a premium, the old way of doing the job no longer sufficed.



Closeup of work station of a LeBlond 17 in. Regal lathe with special tooling for turning the grinding size on the OD and two diameters on the ring lands.

Experimentation finally resulted in the adoption of the Deepfreeze technique for shrinking the bushings. For this purpose the company acquired two Motor Products Deepfreeze cabinets which provide a freezing chamber temperature of minus 120 F. A short exposure in the cabinet makes it possible to fit the bushing with a very light press fit, free from distortion.

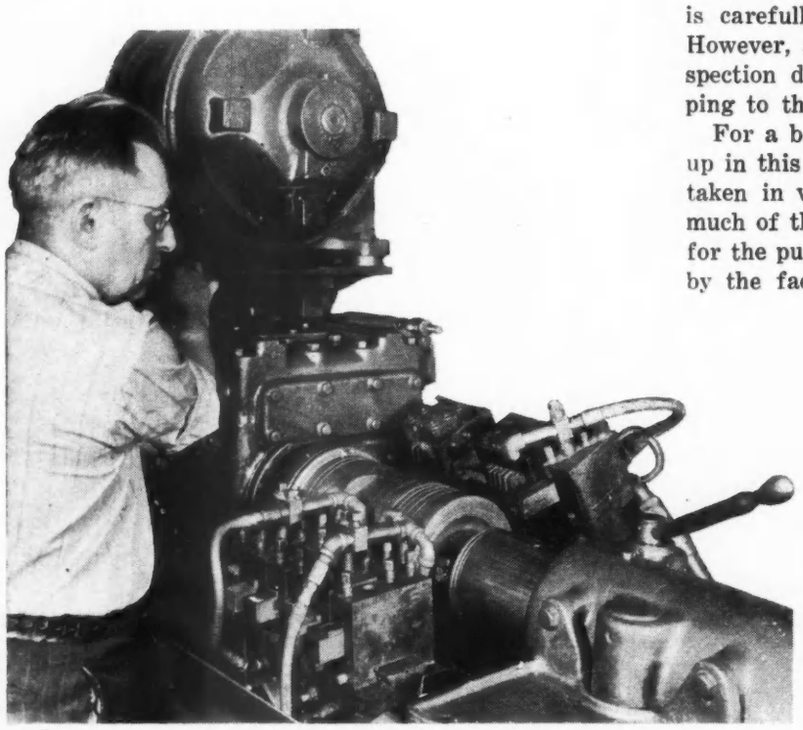
Since this equipment is now available, the Deepfreeze method will be in the opinion of the writer used extensively for the assembly of interference-fit bushings in postwar production. In addition, the equipment is used for the cold hardening of cutting tools and drills other than carbides.

The Ohio Piston Co. claims to be one of the earliest to experiment with sub-zero hardening of conventional tool steels in an effort to solve the formidable problem of producing tools capable of giving reasonable life in machining alloy cast iron with a Brinell of 310. Over a period of some years they have developed a procedure for cold hardening the variety of forming tools, drills, and milling cutters which yields a minimum of four times normal life expectancy.

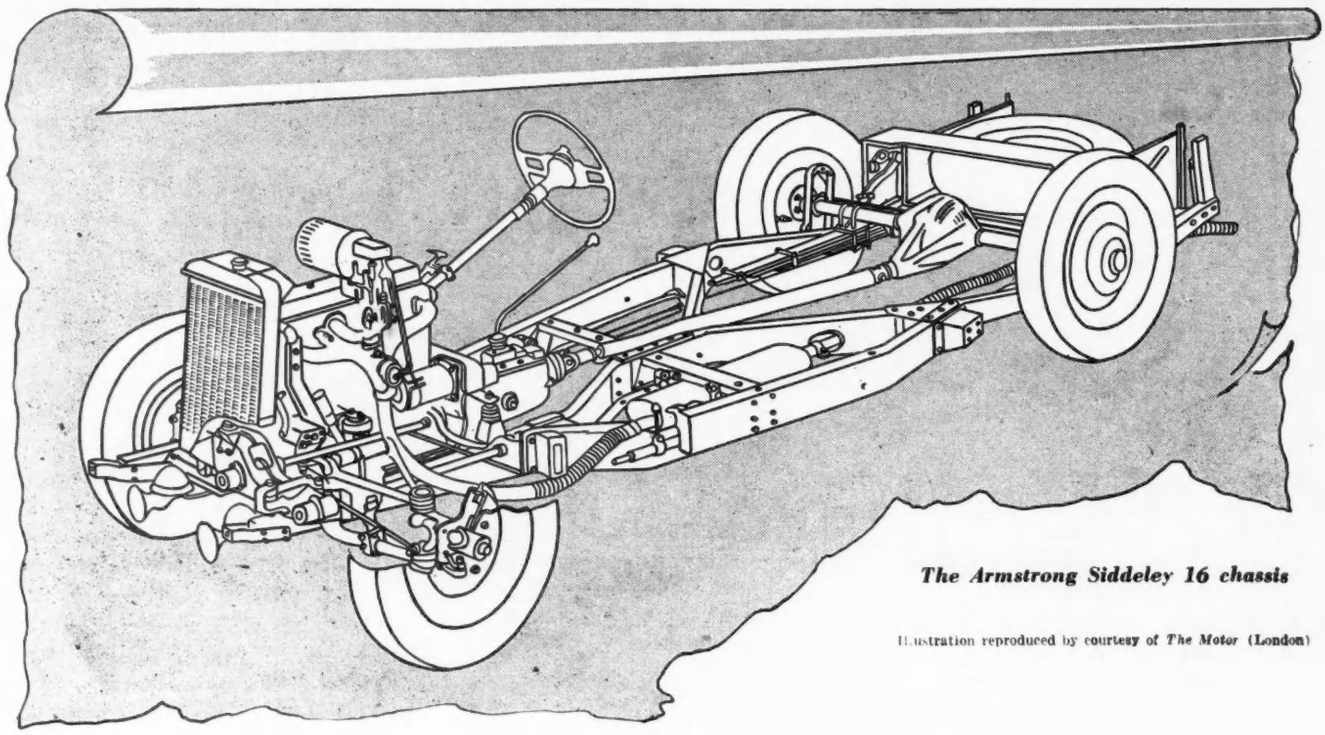
Owing to the wide range of pistons processed over the many production lines mentioned earlier, it seems best to select several typical examples illustrating the standard methods pursued in this plant. Accordingly, we have outlined below the sequence of operations for an automotive Lynite piston and for a large cast iron piston for Diesel engines.

In view of the quality required in modern pistons, inspection is rigid and is carried out on a 100 per cent basis. In the normal course of events, each operation is carefully checked in the production department. However, all pistons are routed through the final inspection department for final screening before shipping to the customer.

For a better impression of the manufacturing setup in this plant, we have selected some factory views taken in various departments. It will be noted that much of the machinery is of the latest type available for the purpose, equipped with special tooling devised by the factory management.



Here is one of a large battery of J&L Fay automatic lathes, this one being a No. 12. It is fitted with special cemented-carbide grooving tools of Ohio Piston design and is used for cutting ring grooves in heavy duty cast iron pistons having a hardness of 310 Brinell.



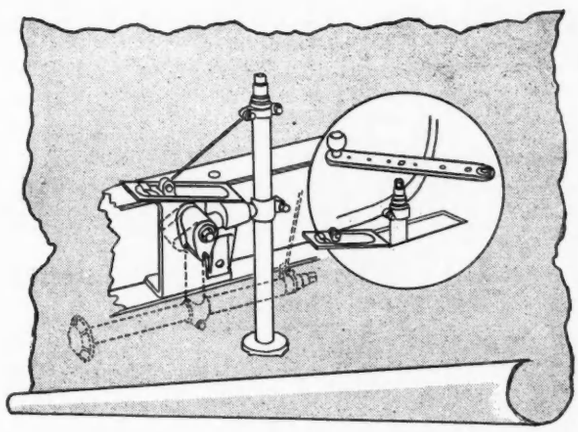
The Armstrong Siddeley 16 chassis

Illustration reproduced by courtesy of *The Motor* (London)

Design Features of the British

Armstrong Siddeley 16

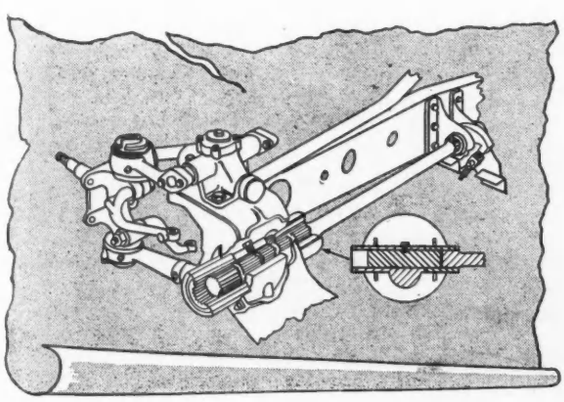
INCORPORATED in the new Armstrong Siddeley 16 passenger car now in production in England are several interesting mechanical features, including independent front suspension with torsion bar springs, built-in mechanical jacks, hydraulic front brakes and mechanical rear brakes equipped with a device that compensates for lining wear, and an underslung frame at the rear. Two body types are being built—a four-door sedan and a convertible coupe. The engine is a 70 hp valve-in-head unit and a Wilson preselective type transmission is available as optional equipment.



Permanently installed mechanical jack, attached to the frame. can be operated from inside of the car, as shown in inset view.

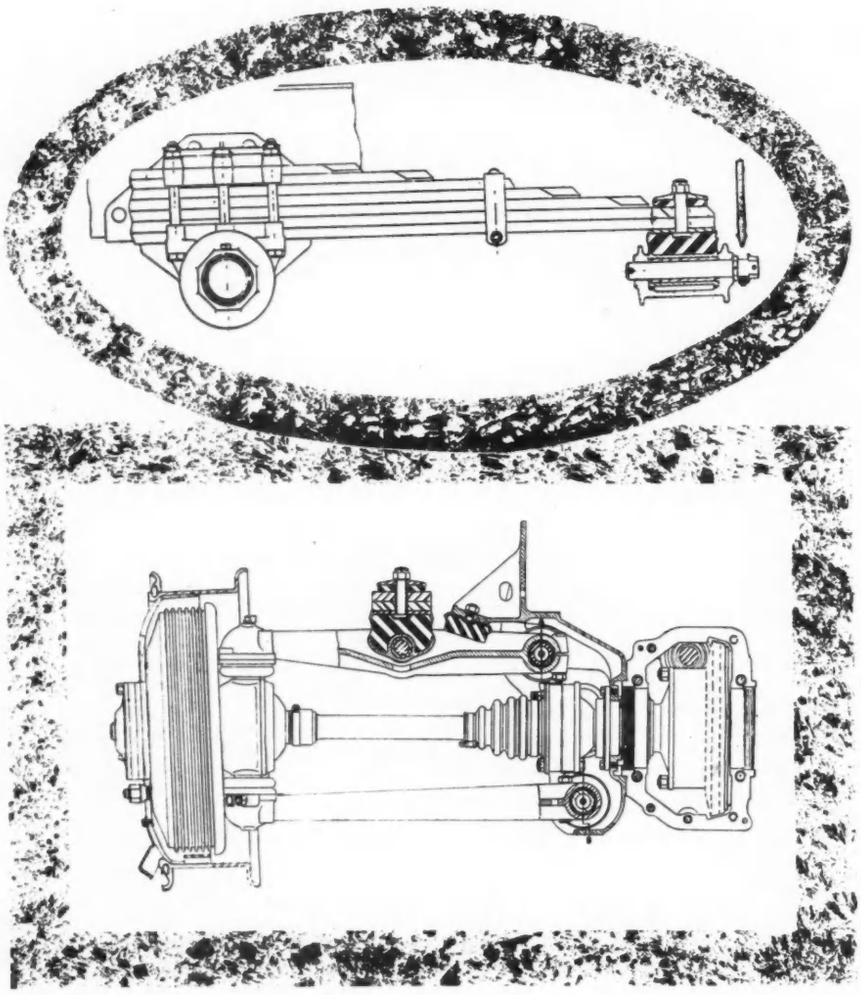
Suspension at the front is by transverse arms of unequal length and torsion bars. On each side there is a short wishbone. Fig. 1 shows how this connects to an built-in Luvax-Girling hydraulic shock absorber on top of the frame and houses a steering pivot at the wheel end. Beneath this, there is a single arm carrying the lower steering pivot (there being no king-pin) which is splined on to an intermediate member, which in turn has external splines engaging internal splines in torsion bars placed parallel to the frame.

(*Turn to page 32, please*)



Cutaway sketch of the Armstrong Siddeley 16 front suspension showing the torsion bar spring and the Luvax-Girling shock absorber. Inset shows sectional view of adjustable reaction point at rear of torsion bar spring

Reports on German



GERMAN mechanized war equipment and engineering developments were evaluated early in March at a national meeting conducted for that purpose in Detroit by the Society of Automotive Engineers and attended by more than 450 engineers. Important data were presented by specialists from industry, American and British armed forces who were members of missions that made technical investigations following the advance of the Allied Armies through Western Europe into Germany.

The most useful information was obtained from fighting vehicles. Throughout the war Germany in its development program concentrated on tanks and armored fighting vehicles and gave little attention to regular motor transport, a policy that later contributed much to the failure

Eight - wheeled armored car and one of its suspension units. The view shows the leaf-type spring mounted outside and parallel to the frame side rail.

By James R. Custer

Military Vehicles

Engineering Data Presented at SAE National Meeting in Detroit; Maybach Gasoline Injection Engine and Tatra Air-Cooled Diesel Are Outstanding Powerplant Developments

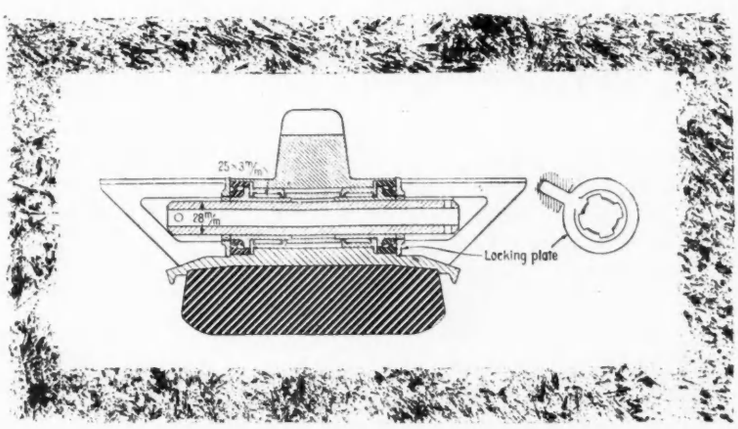
of the German transportation system. In fact when tank production became affected during the latter part of 1944, it was not due to the bombing of tank assembly plants and components factories, but to the disruption of the transportation system. Instead of standardizing on a limited number of vehicle designs, the Germans produced a variety of special vehicles which proved quite costly and of limited use.

Opinions of key personnel from the German motor vehicle industry were conveyed to the SAE meeting by Lt. Col. C. H. Corey, of the U. S. Army Ordnance Dept., in his general summary of German industry, its organizations and accomplishments. Little sacrifice was necessary in the production and quality of vehicles until the latter part of 1944, he said. Gear material was changed from a nickel-chromium steel to a molybdenum-chromium steel with equal quality obtained by careful heat treatment of the latter steel. Opel developed good steel radiators to overcome the shortage of brass. To effect a savings in sheet metal cab panels were made of a wood type pasteboard, and made use of the plentiful alloy steel brackets. But the breakdown in vehicle production came during the last three months of the war in 1945 when lack of rubber and tires prevented the delivery of vehicles.

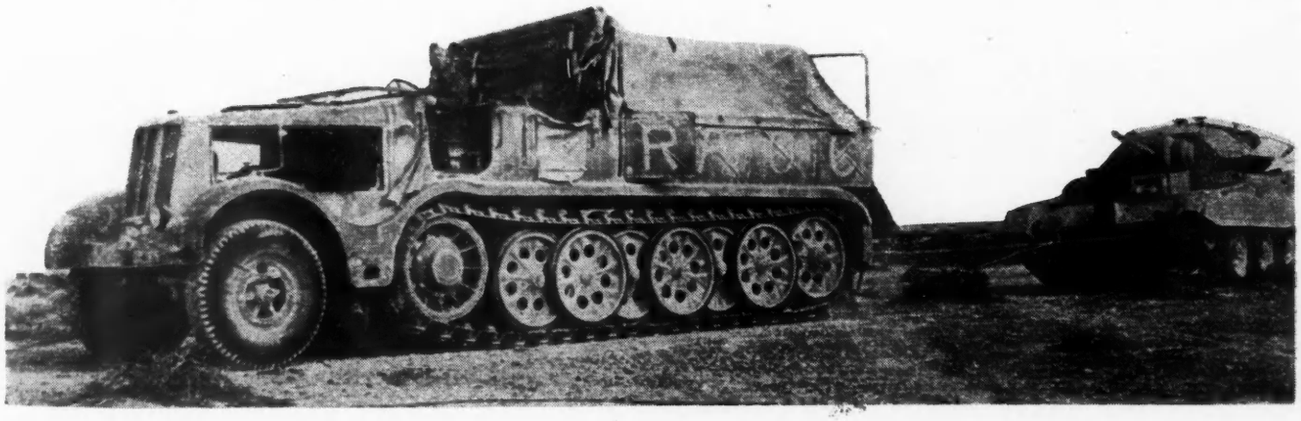
Production figures for full-tracked armored fighting vehicles, obtained from Dr. Stielė von Heydekamph,

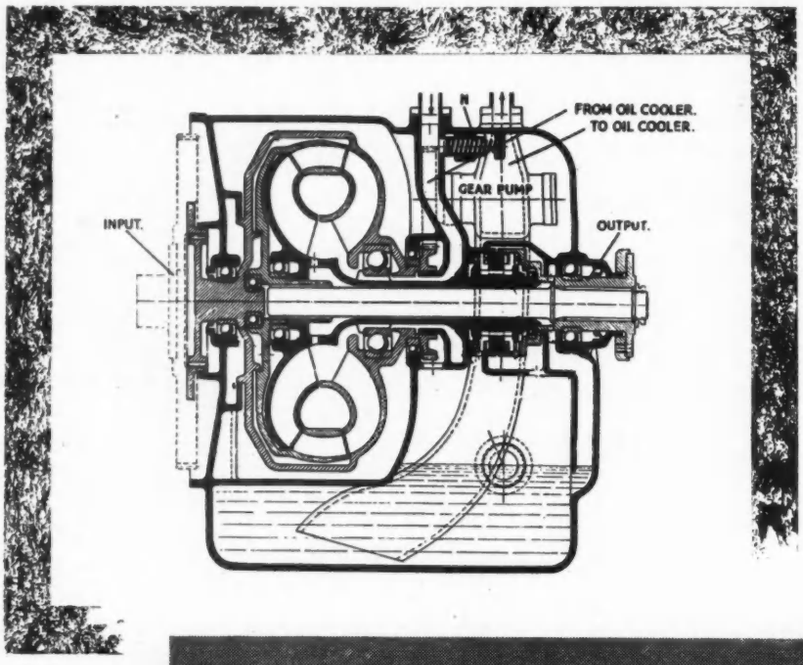
Production of German Full Tracked Armored Fighting Vehicles

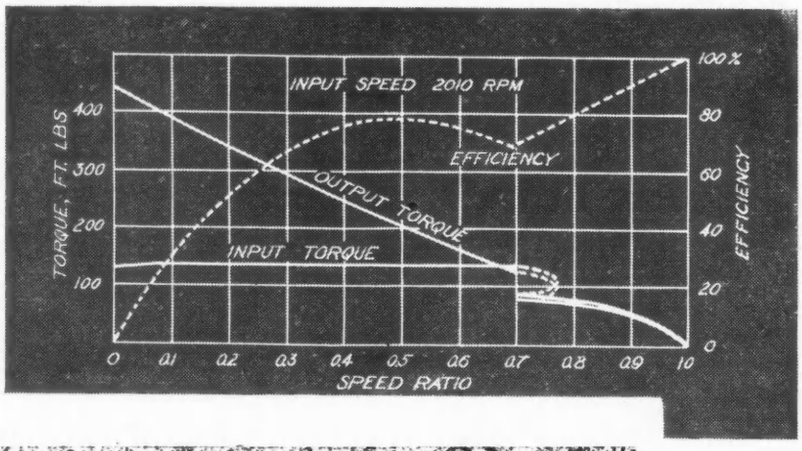
	1939	1940	1941	1942	1943	1944	1945 (Planned)
Tanks (360° turret).....	249	1460	3256	4198	5996	8328	5400
Armored Fighting Vehicles.. (Limited traverse)	..	184	548	1799	6155	10759	26400
Total	249	1644	3804	5997	12151	19087	31800

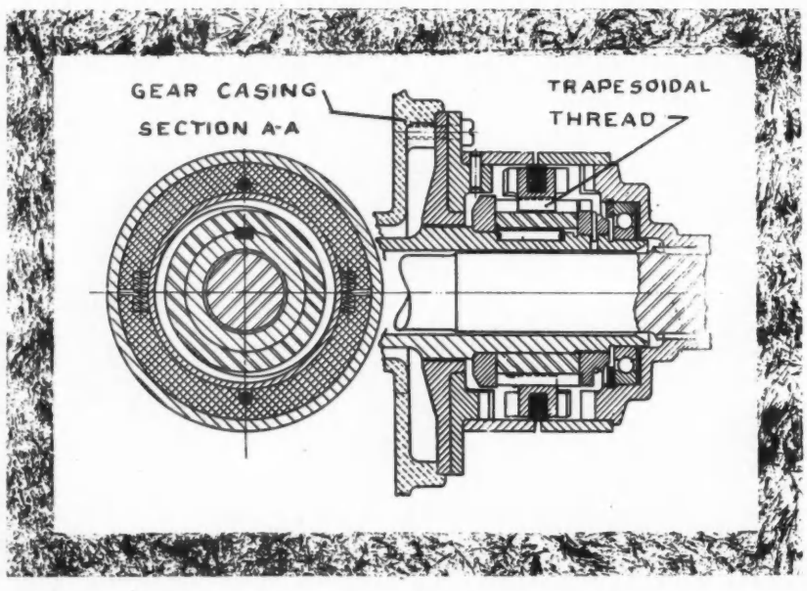


Heavy duty ¾ track tractor used for towing tanks. The sectional view shows the needle bearing mounting of track ring.









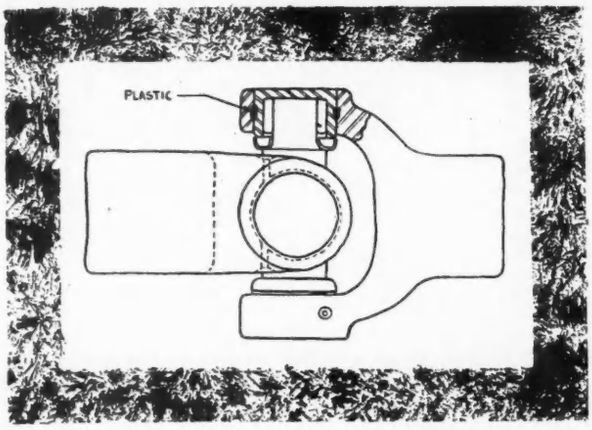
Hydraulic torque converter used in radio-controlled vehicle. Other sectional view shows automatic reaction member control of the converter. The chart gives torque and efficiency curves claimed for this unit.

chief of the main committee for tanks and of the tank development commission, disclose that Germany had produced only 249 tanks in 1939 at the start of the war. Despite extensive bombing, tank and AFV production in 1944 was 57 per cent greater than in 1943. Production data for the years of 1939 to 1945 are given in the accompanying table. The Germans had under development some super-heavy tanks until the middle of 1944 when work on them was stopped, it having been concluded that the weight of a tank should not exceed 50 to 80 tons.

Although transport engine design was frozen in 1939, there was considerable activity in other fields with high priority given to the development of tank and armored car engines. Before and during the war the most dominant influence on the design of German military vehicle engines was the fuel outlook, so in 1942 when the oil industry advised the General Staff of an impending gasoline shortage, it was decided to develop Diesel engines for armored vehicles and motor transport. A summary of the progress made by the Germans with their military engines was presented by Maurice A. Thorne, General Motors engineer.

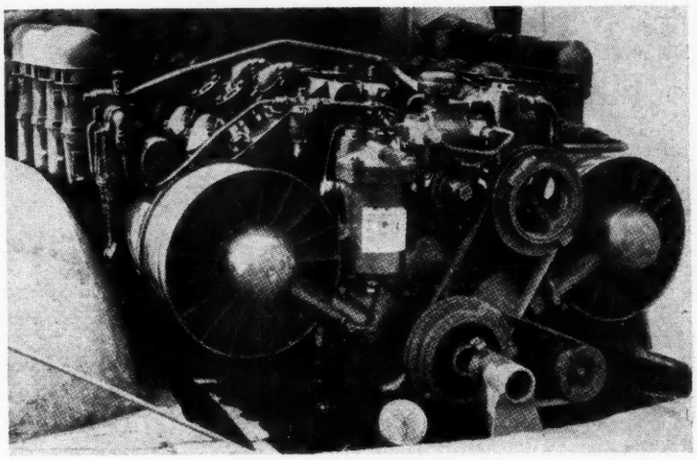
The most successful engine to come out of the Diesel development program was the Tatra four-stroke V-12 of 905 cu in. displacement. Its output was 220 hp at 2250 rpm. Each bank of finned cylinders was cooled by air circulated from a fan at the front end. At the end of the war this engine was being installed in eight-wheeled armored cars and plans called for its use to be extended to other armored cars and light tanks.

The most highly developed engine in production when the war ended was the Maybach HL-230, a liquid-cooled V-12 gasoline powerplant rated at 650 hp. By changing to fuel injection and upping the compression ratio from 6.4:1 to 7.0:1, its output was increased to 850-900 hp. This improved version, designated the Maybach HL-234 and regarded as the outstanding achievement in the engine development program, was scheduled for production by the middle of 1945 for



Volkswagen universal joint with plastic retainer

Front end of Tatra air-cooled V-12 Diesel.



Panther and Tiger tanks. Supercharging at five psi was tried and although there was a gain in power and fuel economy, they were not considered sufficient to warrant the addition of a blower. The HL-234R, a Diesel and the third version of the same basic engine, developed 550 hp.

The Volkswagen four-cylinder gasoline engine was to be replaced by a two-cylinder, two-stroke Diesel developing 25 hp at 2400 rpm and equipped with a Roots type blower. Both engines were the air-cooled, horizontally opposed type. In addition to air-cooled Diesels of 800 to 1000 hp for tanks, experimental work also was being done on a gas turbine powerplant. The goal was an increase of 30 per cent in power without an increase in size over a conventional engine and fuel economy equivalent to an automotive Diesel by using a rotary ceramic heat exchanger.

Fred M. Young, president of the Young Radiator Co., brought to the meeting extensive data and illustrations on German radiator and oil cooler design, and highlights of manufacturing facilities and practices. He found that the lack of copper, brass, tin-solder and other essential materials forced the industry to develop substitute products instead of normal refinement of prewar designs with the exception of aluminum radiators used in aircraft applications. At Finsterwalder in Eastern Germany a well-equipped plant of the Swedish Fimag Works turned out aircraft radiators of the continuous fin and tube type.

Tanks, trucks and other vehicles had radiators with steel or brass tubes and fins invariably of steel. Core and parts were zinc plated by dipping to make them corrosion resistant. One large manufacturer developed a radiator made of zinc. Compared with an American radiator of

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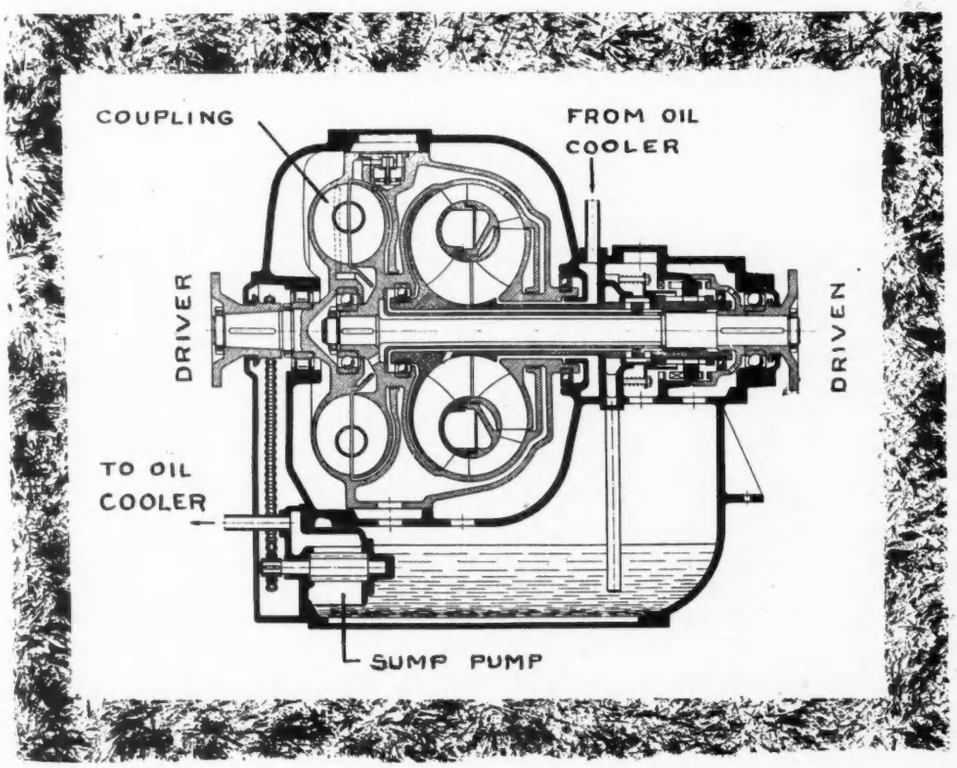


Single-stage torque converter and fluid coupling in tandem.

The Mathis

(Left) Mathis three-wheel, three-passenger economy car, and the interior arrangement of the passenger compartment (below).

DESIGN plans for the Mathis passenger car provide two models, one of which is the French version described in this article by Mr. Bradley. The other is an American model to be built in the United States for the domestic and export markets. At the

THE Mathis three-wheeler was developed under control of German officials during the last four years in the Mathis French factory. Operating economy under postwar conditions was the main objective of the design. A three-passenger car, with a water cooled flat two-cylinder engine driving the front wheels, the Mathis weighs 837 lb (curb weight). Principal dimensions of the car are: length over-all, 133 in.; width, 70 in.; height, 58 in.; tread 40 in.; wheelbase, 90 in. Its maximum speed is 65 mph. Two official tests gave the following results: Under Paris traffic conditions with dead weight of 837 lb, useful load 346 lb, total weight 1183 lb, a distance of 34 miles was covered with a gasoline consumption of 63 mpg (U. S. units). Operating on the open road with a dead weight of 837 lb, useful load 540 lb, total weight 1377 lb, a distance of 186 miles was driven at an average speed of 40.3 mph, and the gasoline consumption was 64.8 mpg. These tests were made with normal compression, ignition and carburetor setting, and with a tire pressure of 32 psi. The car has a useful floor area of 22 sq ft, thus providing ample room for three people, plus a certain amount of space for baggage on each side of the rear wheel housing.

Jean Andreau, who is principally responsible for the design, put the emphasis on streamlining and low weight. Both of these were deciding factors in the designers' choice of a three-wheeler in place of a vehicle with four wheels. By omitting a wheel the saving in weight is from 25 to 30 per cent, while the central rear wheel allows the most efficient streamlined form without any cumbersome rear overhang. Andreau protests against the popular idea that air resistance is negligible below 60 mph, and has issued the following data from experiments with this car:

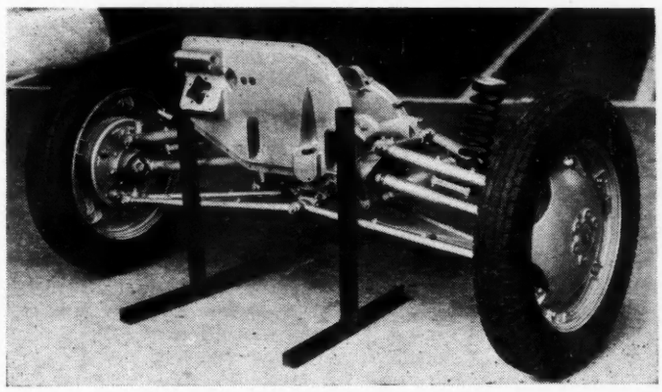
WEIGHT—1256 lb
Tire Pressure—32 psi

Speed, mph	24.8	37.2	49.7	62
Power Required:				
Head Resistance, hp	0.492	1.67	3.94	7.75
Rolling Resistance, hp	1.125	1.75	2.25	3.63
Total hp Required:	1.617	3.42	6.2	11.38

Fifteen bhp are sufficient to meet all requirements,

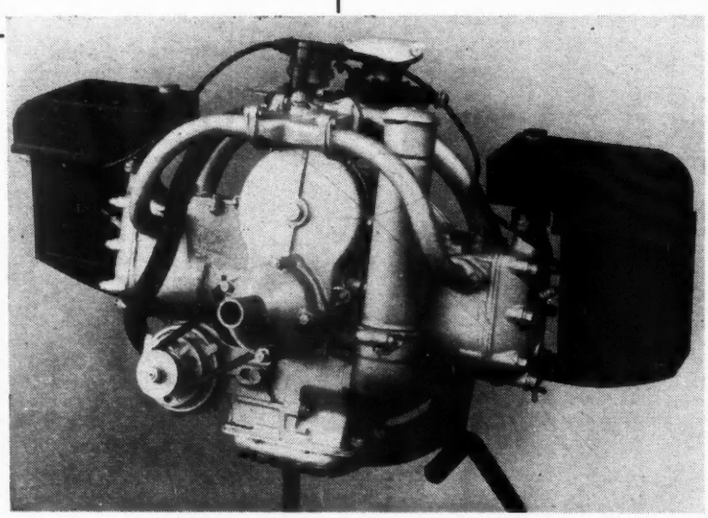
Three Wheel French Economy Car

By W. F. Bradley
Special Correspondent of
AUTOMOTIVE *and* AVIATION INDUSTRIES
in France



Details of the front suspension and drive systems.

present time design work is being done on the American model under the direction of E. C. Mathis, president of the Matam Corp., New York. Its principal differences from the French car will be a longer wheelbase and a new engine of greater power.



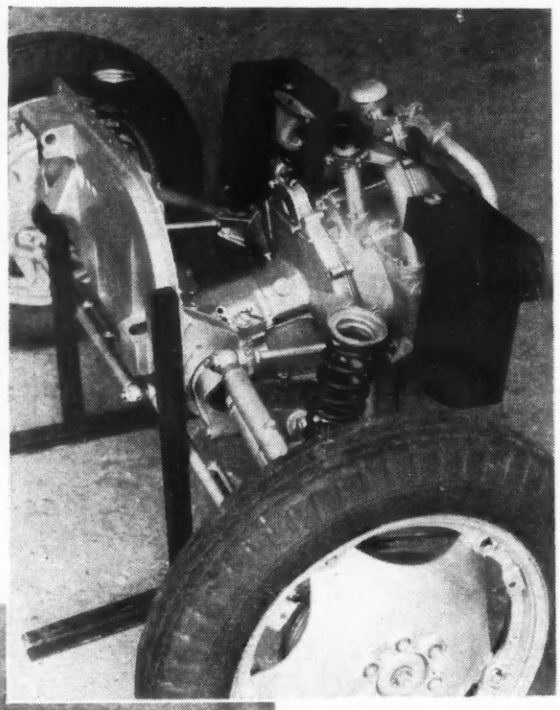
Mathis two-cylinder engine with individual cylinder radiators attached directly to the cylinder heads.

and this led to the adoption of a front drive water-cooled flat two-cylinder engine of 75 by 80 mm bore and stroke (43 cu in.). After many experiments, including plywood studies, it was decided to make an extensive use of aluminum alloys. This metal puts the cost up about 18 per cent (in France) compared with sheet steel, but it lowers the maintenance charges. From the national standpoint it has to be considered that 1½ ton of coal are said to be necessary to produce steel for a 3000 lb car, while the aluminum alloy is produced by hydro-electric power.

The body is a monocoque structure of box section built up of sheet aluminum. Following aviation practice, the box sections increase towards the front, where they join up to an aluminum alloy ribbed casting forming a forward bulkhead with the housing for the driving and steering mechanisms. A light but extremely rigid body is obtained, as is shown by the fact that under a load of 2650 lb (6½ times the maximum useful load) the deformation is only 0.110 in.

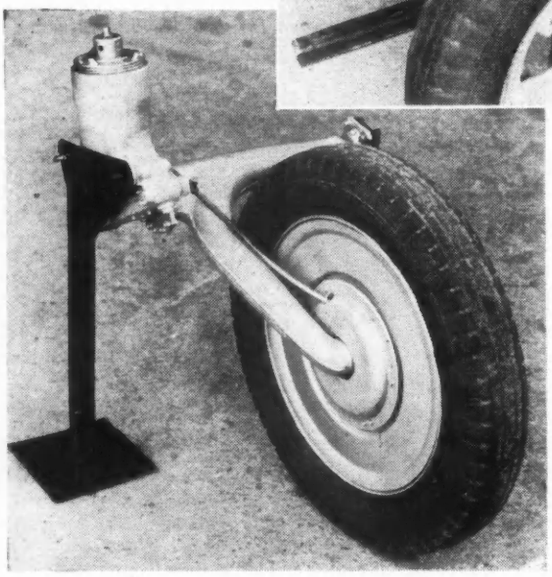
A considerable saving of weight is effected by grouping all drive components and mounting them on the aluminum alloy dashboard, which, in turn, is bolted to the body. Incidentally, there is the advantage, from a service standpoint, of being able to withdraw the entire power plant—engine, clutch, transmission, front suspension, and steering — and replace it by another unit in approximately two hours.

The flat two-cylinder engine has aluminum cylinders with iron liners, an aluminum alloy head, side valves with bronze seats, and only two cams driven by Celoron gears. A feature of the engine is the use of a three-throw crankshaft, one of the pistons having a conventional connecting rod and the other having two rods, the pair being equal in weight. Another feature is that there is a radiator for each cylinder, mounted directly on the cylinder head, without the use of rubber hose. There are no fans, for the air is admitted at the point of maximum pressure and is expelled at the points of maximum depression as determined on



(Right) Mounting of the powerplant ahead of the dashboard.

(Below) The rear wheel assembly.

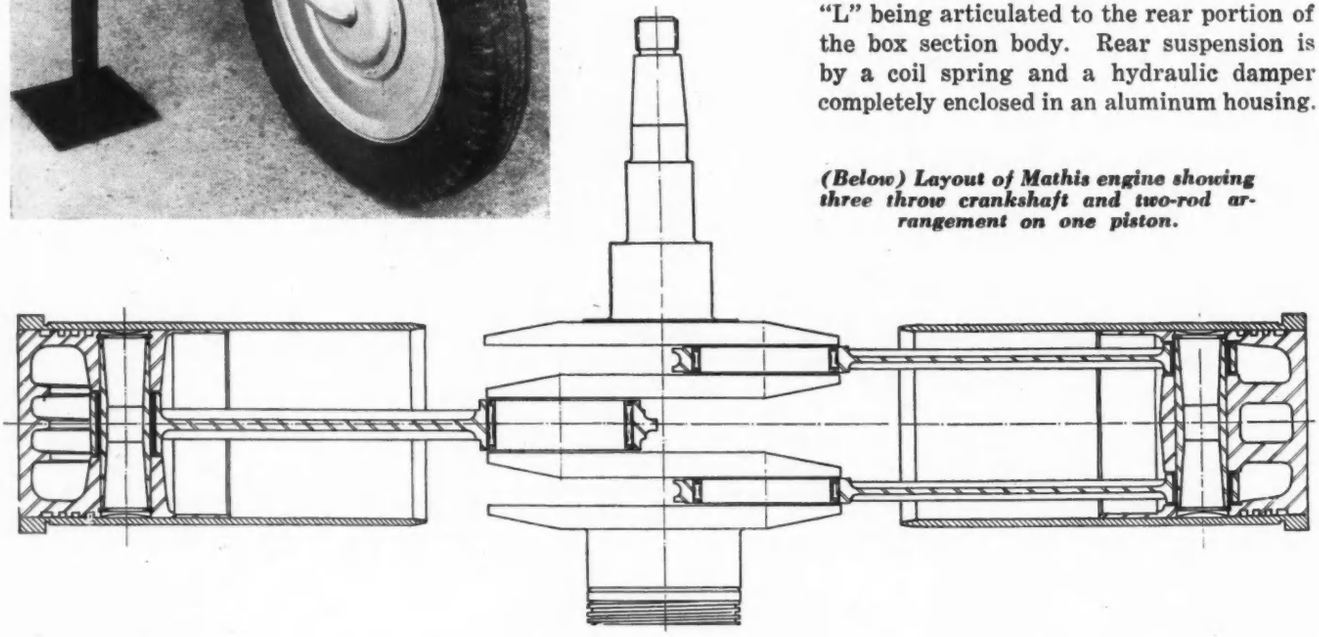


models in the wind tunnel. Engine speed is kept down to 3300 rpm, at which speed the power output is 15 bhp. The crankshaft is carried in a plain bearing in front and a needle bearing at the rear. Lubrication is high pressure throughout.

The clutch is a single plate type, and the transmission is the normal type, with synchromesh for second and third gears and direct drive on fourth. The final drive gear is a spiral-bevel, and the universal joints are Spicer with needle bearings. Lockheed hydraulic 10 in. brakes are used on the front wheels, the rear wheel having merely a hand operated parking brake. The attachment of the power plant is by means of two rubber lined trunnions, which provide a limited floating action.

Front suspension is by wishbones of chrome molybdenum steel, with coil springs and shock absorbers. The entire mounting is on extensions of the dashboard carrying the power plant. The rear wheel is carried on an L-member, formed of two steel pressings welded together, the transverse arm of the "L" being articulated to the rear portion of the box section body. Rear suspension is by a coil spring and a hydraulic damper completely enclosed in an aluminum housing.

(Below) Layout of Mathis engine showing three throw crankshaft and two-rod arrangement on one piston.



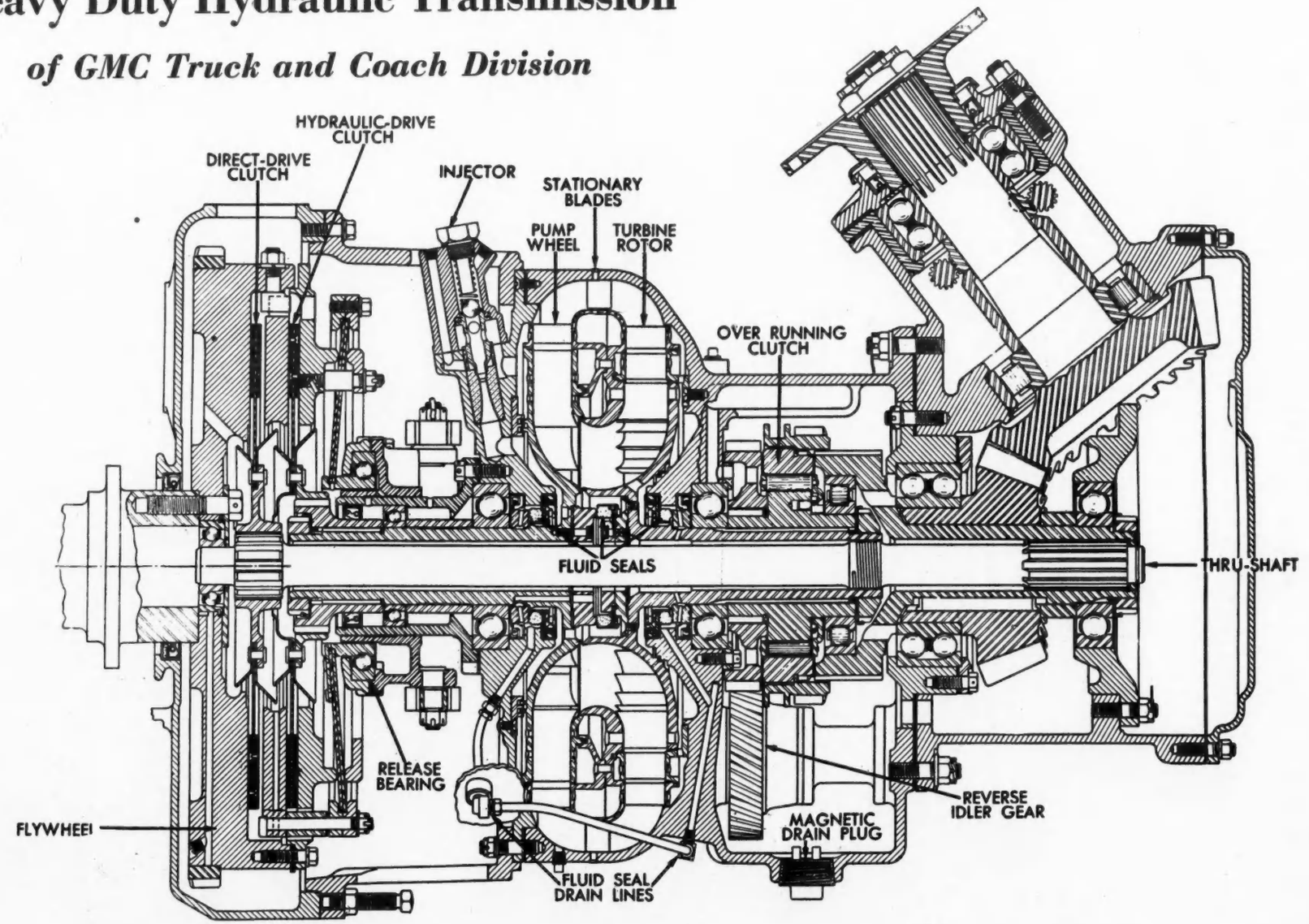
Armstrong Siddeley 16 (*Continued from page* 25)

Two Smith mechanical jacks are attached, one to the inside of each frame side member, and these can be operated from within the body by lifting a panel in the floor. Normally, they are disposed horizontally, but by means of a link attached to the floor panel cover they can be swivelled through 90 degrees (see Fig. 2) and then rapidly wound down to the road. This done, the car can be jacked up by means of a ratchet lever, the entire one side of the car being lifted with the two wheels clear of the ground.

On the convertible model it is possible to have the top open over the front seats only, or fully down at will. Zipper fasteners are used to seal the top to the folding side rails. The floor of both cars is sound-proofed and all floorboards are located by dowels so that there can be no difficulties of alignment when fitting, should they be removed for work on the chassis.

Heavy Duty Hydraulic Transmission

of GMC Truck and Coach Division



Eliminating Brittleness in Aluminum-Hydraulic Sleeves

ONE of the smallest, yet one of the most important parts of an aircraft hydraulic system is the sleeve coupling. The function of this little sleeve is to take up the pressure exerted by the coupling nut and force the flared end of the tube against the mating nipple thus forming a positive seal and a strong tight joint. Accordingly, the material from which this fitting is made is of primary importance. The requisites are that it be strong enough to withstand a high compressive stress and yet be ductile enough to deform slightly in order to distribute the load evenly around the flare of the tubing. In addition, the alloy must be corrosion resistant, inexpensive and easy to fabricate.

An alloy meeting these requirements and one that is probably the most widely used today in sleeves of the AN-819 type is aluminum-silicon bronze having a nominal composition of 90 per cent copper, 7.5 per cent aluminum, 2 per cent silicon and 0.5 per cent impurities. Until recently sleeves made of this or comparable alloys were, for the most part, satisfactory in all instances. However, the added firepower and increased horsepower of the modern aircraft have resulted in greater vibration, and consequently have necessitated higher installation torques to insure tight fittings. These two factors have led to cracking of the hydraulic sleeve.

Slow cooling, such as that encountered in the drawing of bars from which these sleeves are machined, allows a complex Al-Si-Cu eutectoid to form which often builds up a very hard and brittle network through the material. This eutectoid can be called the delta phase. The amount of delta incorporated in the structure will depend, of course, on the chemical composition and the rate of cooling from the soluble range. All sleeves that cracked under service conditions and all those that failed to conform to the crush test (explained later) have a comparatively heavy network of the delta eutectoid as is shown in Fig. 1A. as a dark gray constituent. A recommended etching procedure to darken the delta phase is as follows: Immerse sample in concentrated HNO_3 for 3 seconds and follow by a 15 second immersion in a solution of 5 grams $FeCl_3$ and 10 cc HCl in 100 cc H_2O.

Crush Test

It was found that by crushing sleeves radially in a vise until the inside diameter is one-half its original value, a determination of their brittleness could be made. The sleeves fall into either of two cate-

Fig. 1
A—Photomicrograph (250X) showing heavy delta network in secondary alpha grain boundaries.
B—Photomicrograph (250X) of typical sleeve structure after prescribed thermal treatment. Note the complete absence of the delta phase.

Silicon-Bronze for Aircraft

By Lawrence J. Barker
Metallurgist,
North American Aviation, Inc.

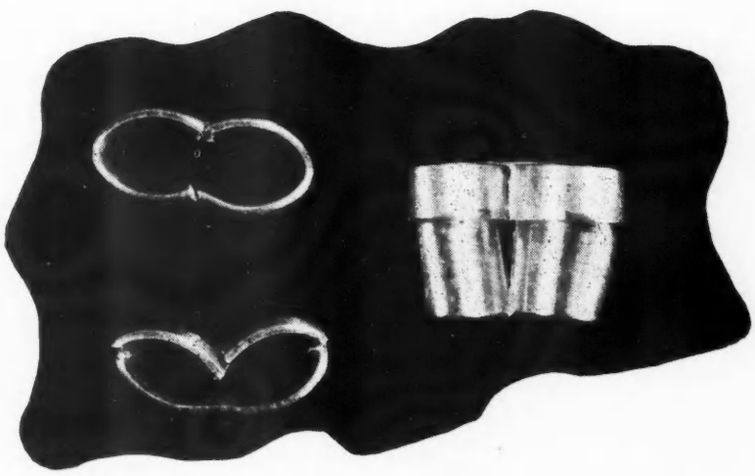


Fig. 2—Brittle sleeves that failed in th crush test. Approximately 20 per cent of non-treated sleeves fail in this manner.

gories: those that crush into a form like a figure eight usually accompanied by a sharp snapping sound, or those that crack slightly on the ends or not at all. Fig. 2 shows sleeves that failed this test and Fig. 3 shows the acceptable type.

A hydraulic sleeve seems to have a critical inside diameter in relation to its wall thickness making it especially sensitive to a crush test. The small diameter, especially in the size 5 and 6 sleeve (for 5/16 ih. and ⅜ in. tubing respectively), causes higher unit stresses upon crushing. The small wall thickness allows any appreciable network of the brittle phase to form a fairly continuous radial weakness in a narrow area.

Thermal Treatment

The delta phase is formed at the eutectoid temperature of approximately 1020 F, so heating this material to a temperature above that range will put this phase back into solution. Then by cooling at a more rapid rate than is normally encountered in the manufacture of rod, the delta constituent will not have a chance to form since secondary alpha forms first and the delta only upon slow cooling. However, many other factors such as possible warpage, the need for strain annealing after machining, stresses caused by quenching, etc., must be considered in the setting up of such a treatment.

For complete elimination of brittleness the best procedure is to heat treat the sleeves after machining and before cadmium plating at a temperature of 1050 F for two hours followed by cooling in air.

Because of the thin wall section and large surface area exposed to the air a more rapid cooling rate is obtained than is possible in the case of thicker sections. This treatment eliminates completely or satisfactorily reduces the delta phase (see Fig. 1B) without distortion of the sleeve itself. It also serves as a strain anneal for any possible stresses imposed by machining.

As to physical properties only a slight loss is incurred. However, the results were above the specification values. This cracking problem became of such importance that Government specifications and aircraft procurement requirements now specify a thermal treatment and a crush test to be given all lots of sleeves produced for military aircraft.

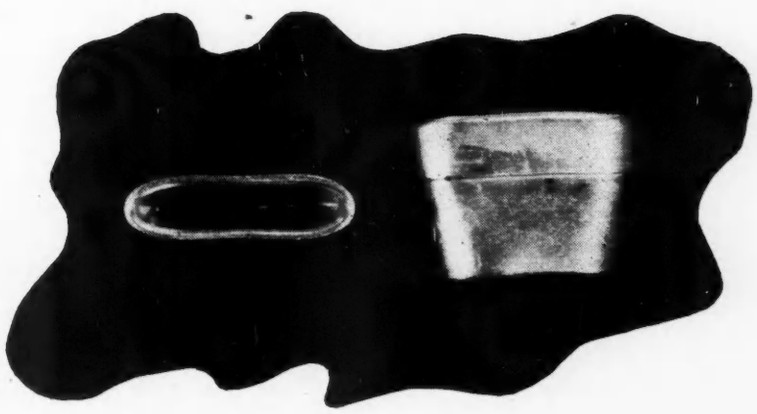


Fig. 3—Heat treated sleeves that have proved satisfactory under the crush test.

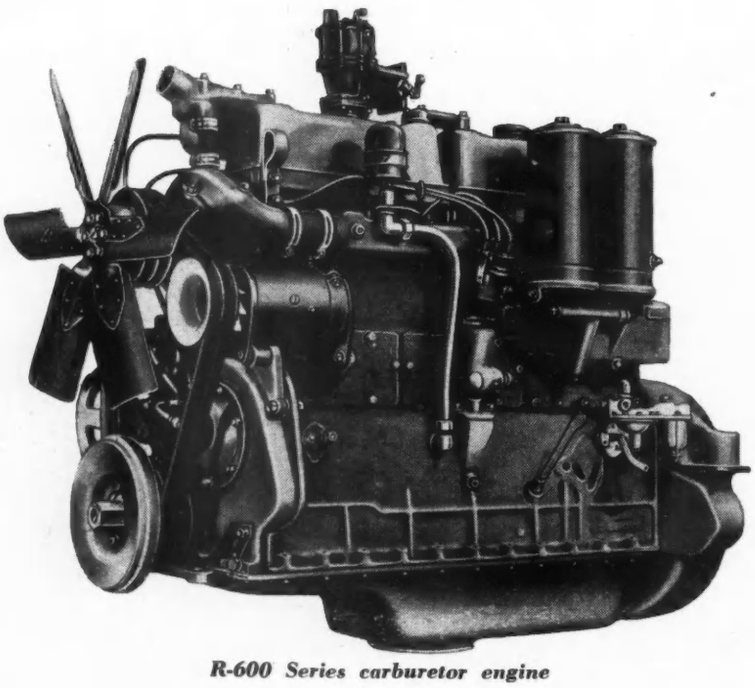
Continental's Consists of Six

ANNOUNCEMENT by Continental Motors Corp. regarding its line of postwar Diesel engines states that because the Red Seal Diesel combustion principle does not develop extremely high pressures usually associated with Diesel engine operation and consequently does not demand excessively heavy structural parts, many of the major elements of these engines are directly interchangeable with Red Seal gasoline engines of the same displacement. In fact, interchangeability is so extensive as to make it possible to offer engines for any type of fuel—Diesel, gasoline, butane, natural gas—for buses, motor trucks, tractors, and industrial equipment with little installation change.

The Diesel line employs the four-stroke cycle, overhead valves, and the "cushioned power" combustion chamber. It is offered in five basic models for industrial and agricultural applications; and in three models for trucks and buses, the latter being higher speed versions of the corresponding industrial models, as outlined in the tabulation below:

Transportation Models	Bore (in.)	Stroke (in.)	Displacement (cu. in.)	Net Bhp at Max Gov'd RPM	Net Torque (Max, Lb-Ft)
KD 6330, 6-cyl.	4	4⅜	330	73 at 2400	197
TD 6427, 6-cyl.	4⅝	4⅞	427	95 at 2400	255
RD 6572, 6-cyl.	4¾	5⅜	572	127 at 2200	340

Note: Power data are observed readings and are not corrected. See accompanying chart for bare engine performance curves. (Page 39)



R-600 Series carburetor engine

Industrial Models	Bore (in.)	Stroke (in.)	Displacement (cu. in.)	Bhp at 2000 RPM (Bare Engine)
GD 157, 4-cyl.	3⅜	4⅜	157	37.5
HD 260, 4-cyl.	3⅞	5½	260	57.0
KD 330, 6-cyl.	4	4⅜	330	79.0
TD 427, 6-cyl.	4⅝	4⅞	427	102.5
RD 572, 6-cyl.	4¾	5⅜	572	137.0

Note: Power data are observed readings and are not corrected. See accompanying chart for bare engine performance curves.

A typical vertical cross-section through the basic cylinder, including the accessories, is shown elsewhere in this article. The interchangeability between the Diesel and carbureted engine is possible since the head is separable and does not change the cylinder and crankcase assembly below. As shown by the horizontal cross-section of the combustion chamber, the fuel injection nozzle is located at the right and the Dyna-Cell chamber at the left. The turbulence chamber is in the center of the cylinder directly under the exhaust valve.

The major feature of this engine is its "cushioned" power combustion chamber with a compression ratio of about 15 to 1. The turbulence chamber concentrates the charge of air around the fuel spray and produces a swirling action or turbulence, characteristic of this design, thus producing a more homogeneous mixture of air and fuel. The Dyna-Cell serves to cushion destructive peak pressures, storing the explosion energy momentarily and then releasing this pressure through its metering orifice as the piston moves down on the power stroke. Thus the structure of the cell absorbes the shock load of the peak pressures and releases the bearings, etc., of the high instantaneous stresses that otherwise would be encountered.

It will be noted that the axis of the cell is at an angle with respect to the fuel injection nozzle. This is done to prevent blasting of the nozzle for one thing, but what is of even greater importance, the angularity is such as to produce a swirling effect over the top of the piston so as to increase turbulence and thus effect more complete combustion and a cleaner exhaust. This arrangement is said to act at the most effective crank angle.

The drop-forged crankshaft is heat treated and dynamically balanced, coun-

New Diesel Line

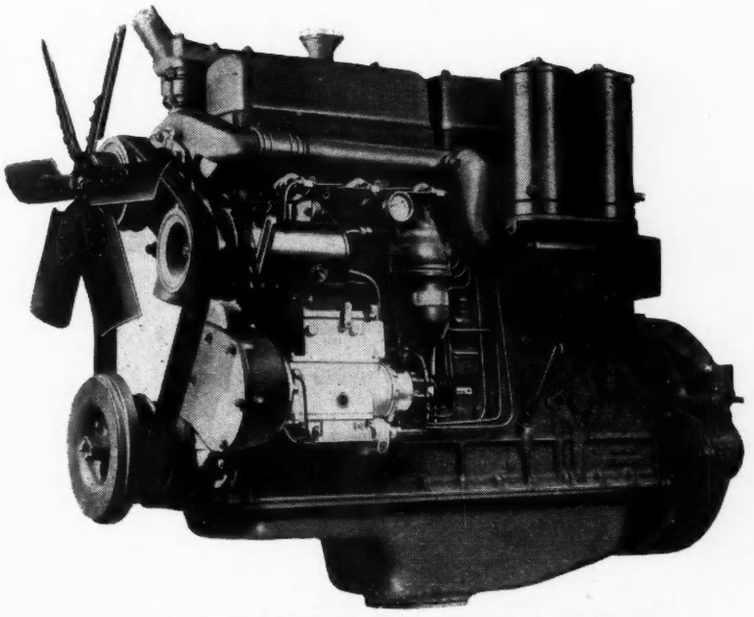
Basic Models

terweighted, and of seven bearing type. Main and connecting rod bearings are of heavy duty steel shell replacable type, lined with bearing alloys suited to the specific application. Connecting rods and camshaft are drop-forged and heat treated. The camshaft is mounted on four replaceable steel-backed babbitt bearings, on the transportation models and on the KD-330, TD-427, RD-572. On the GD-157 and HD-260, the camshaft is a semi-steel casting, heat treated. Cylinder blocks have full length water jackets with a water distribution header. The cylinder head is of cast iron and includes the overhead valve assembly. This design permits the practice of exchange cylinder head assemblies, thus simplifying the fleet operator's problem. Easily removable wet cylinder liners of copper-chromium alloy are supplied as standard on the GD-157 and HD-260; while dry liners are fitted on the RD-572. Pistons are of aluminum alloy, of solid skirt type with a full floating pin. Exhaust valves are of XCR steel used in conjunction with alloy steel seat inserts. The water pump is leak-proof with a patented carbon seal and the shaft mounted on ball bearings.

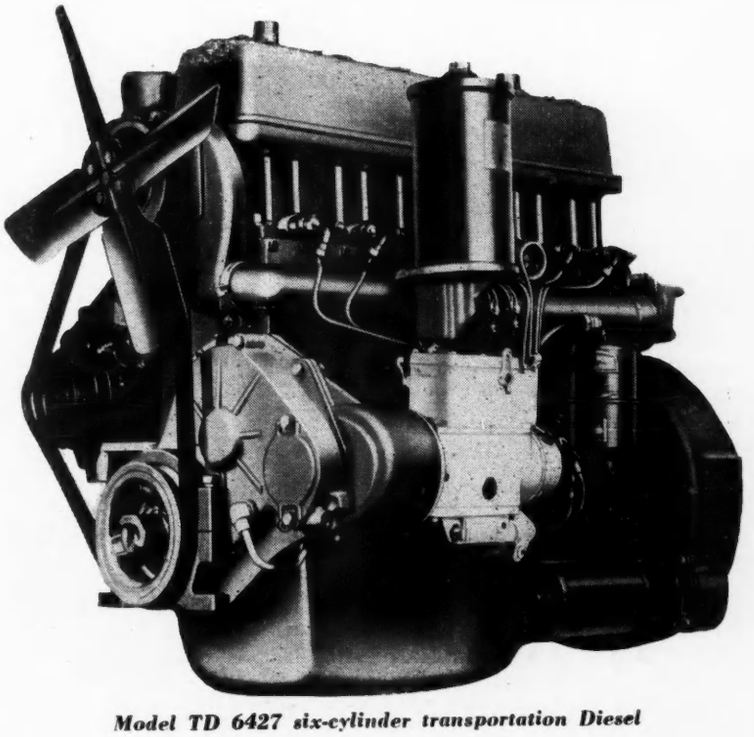
The engine has full pressure lubrication with an oil pump of spiral gear, submerged type of generous capacity. A built-in oil cooler and oil filter are standard equipment on the transportation models; and on the KD-330, TD-427, and RD-572. The conventional road draft tube crankcase ventilation system is standard equipment but the Donaldson valve installation can be made at the customer's option.

Fuel injection equipment is supplied by American Bosch and Ex-Cell-O, in sizes suitable for the various engines, with metered fuel supply and built-in governor with torque control. Two fuel oil filters are supplied for two-stage filtering. Standard generator is rated 12 v, 40 amp capacity but an optional one of 55 amp capacity can be supplied. The starter has a #2 SAE mounting flange and is of 12 or 24 v type to suit requirements.

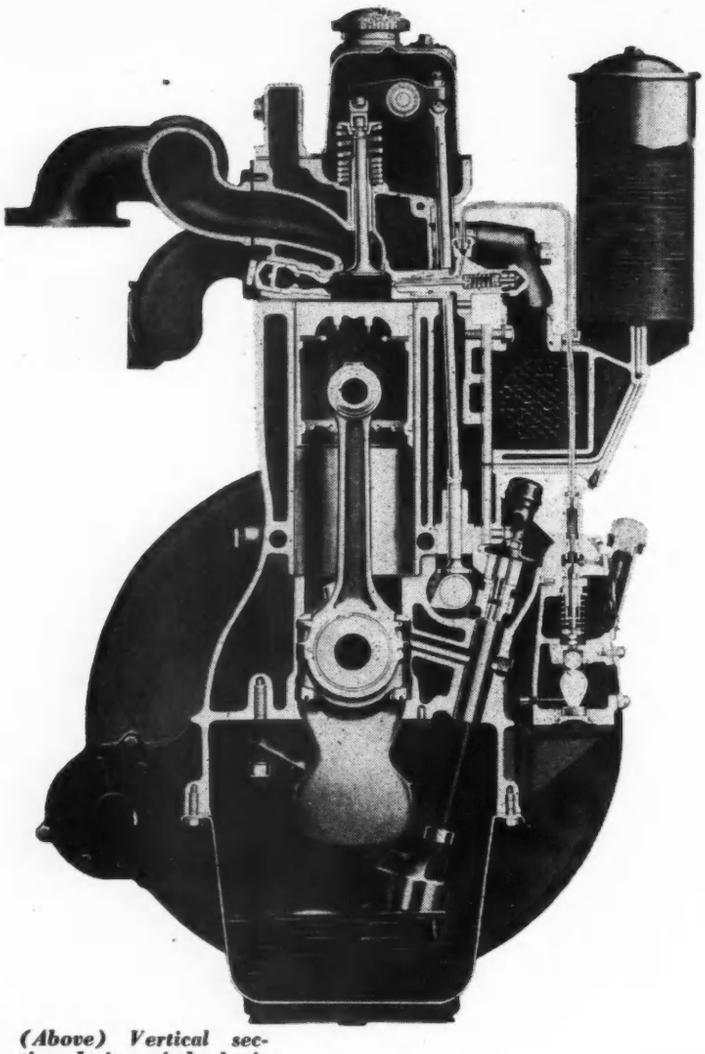
More details of R-600 carburetor engines given in this article



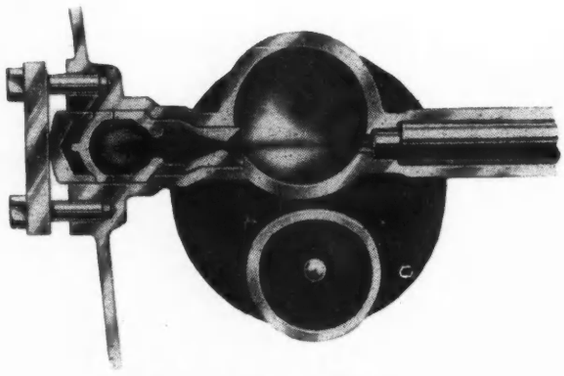
Model RD 6572 six-cylinder transportation Diesel



Model TD 6427 six-cylinder transportation Diesel



(Above) Vertical sectioned view of the basic cylinder and Continental's new Diesel engine line



(Center) Horizontal sectioned view of "cushioned" power combustion chamber.

On truck and bus models the engines are arranged for three-point mounting with a trunnion at the front while rear mounting depends upon the type of flywheel housing selected by the customer. On industrial engines the mounting depends upon the application. In addition, power take-off and reduction gears are available.

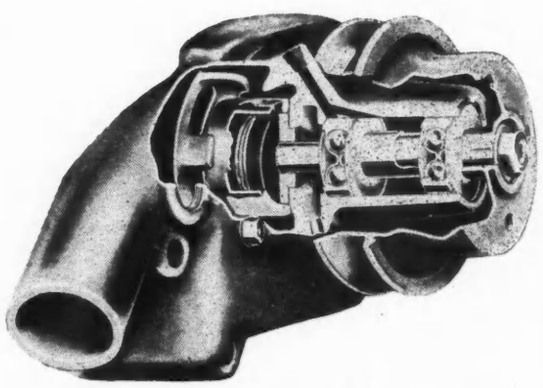
R-600 Series Engines

The postwar family of R-600 engines consists of a basic design of six-cylinder, overhead valve engines with a stroke of 5⅜ in., offered in three bore sizes: 4½, 4¾, and 4⅞ in. The models for use in motor trucks and buses are listed as R-6513, R-6572, and R-6602. These engines were used on military equipment during the war but full details were not released until recently. The same basic engines, modified in detail and horsepower ratings, are offered for industrial powerplant applications in the models: R-513, R-572, and R-602.

The R-600 basic engine features seven main bearings of replaceable type, steel-backed with a lead base babbitt over a sintered copper-nickel matrix, the Moraine Products Durex bearing. Lower connecting rod bearings are of the same type. Crankshafts are drop-forged and designed to give adequate rigidity. The crankshafts are Tocco hardened to provide a hard bearing surface without destroying the tough structure of the load-carrying core. They are counterweighted, balanced statically and dynamically within ½ oz. in., and fitted with a torsional vibration damper at the front end.

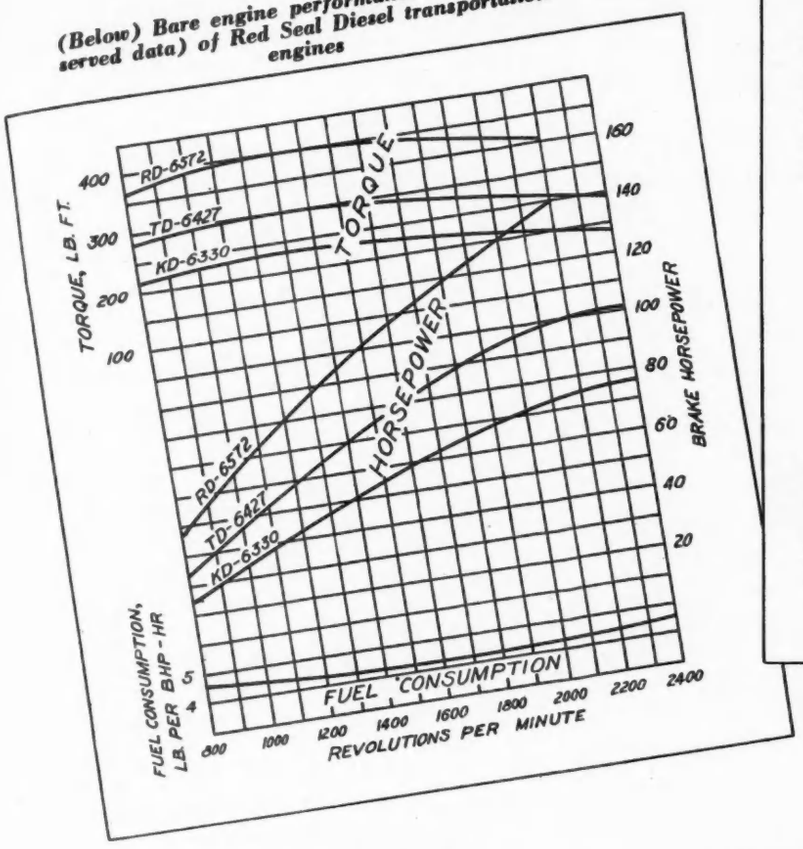
Exhaust and intake manifolds are available for either downdraft or updraft carburetion with the standard feature of individual porting of the intake manifolds. There is a hot-spot which has been developed to ensure quick warm-up with maximum flexibility and minimum loss of power. The exhaust manifold has slip joints to prevent cracking under extreme variations of temperature.

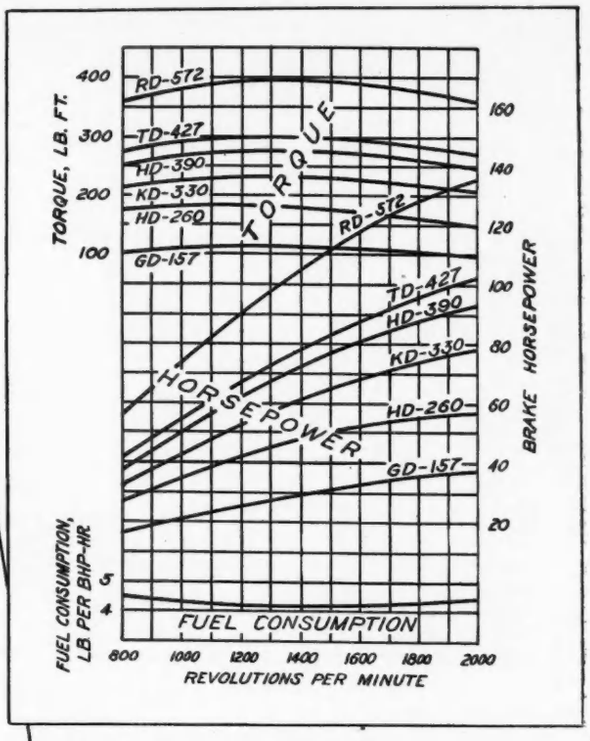
Full pressure lubrication to all main, connecting rod and camshaft bearings, as well as to the timing gears and rocker arms is provided at a pressure of 40 to 60 psi, by means of a large, submerged gear type oil pump driven off the camshaft and protected by a Float-O screen. A large integrally mounted tube type oil cooler and an oil



(Right) Cutaway view of Continental's new water pump

(Below) Bare engine performance curves (observed data) of Red Seal Diesel transportation engines





(Above) Bare engine performance curves (observed data) of Red Seal Diesel industrial engines

TRUCK AND BUS ENGINE DATA

	R-6513	R-6572	R-6602
Number of cylinders	6	6	6
Bore and stroke	4½ by 5⅜	4¾ by 5⅜	4⅞ by 5⅜
Displacement in cu. in.	513	572	602
Governed rpm—maximum	2600	2600	2600
Bare engine hp at governed rpm	164.0	174.3	183.5
Torque—max in lb ft.	400	436	460
BMEP max.	117	115	115
Compression ratio for 70 Octane gasoline	5.9 to 1	5.9 to 1	5.9 to 1
80 Octane gasoline	5.9 to 1	6.5 to 1	6.2 to 1
Weight—Std. Engine—approx. (incl. flywheel housing and manifolds	1525	1525	1525
Equipment Engine—approx. (incl. general accessories and air comp.)	1705	1705	1705

INDUSTRIAL ENGINE DATA

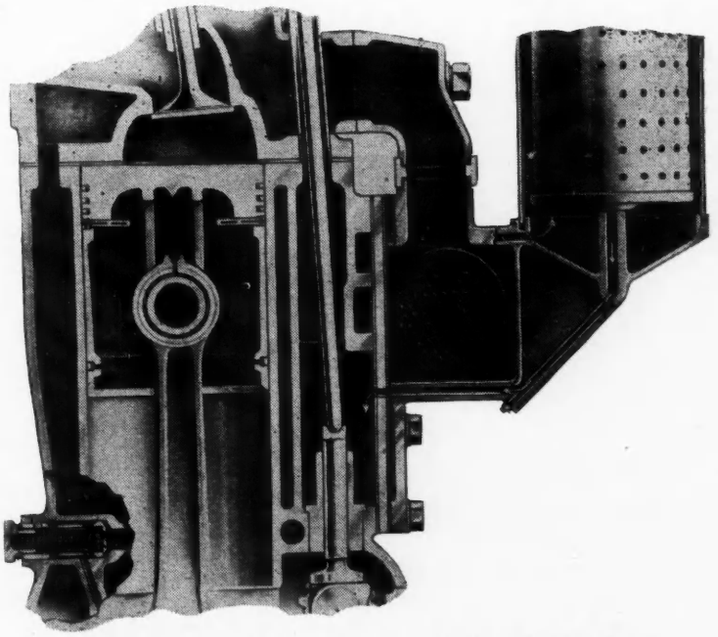
	R-513	R-572	R-602
Number of cylinders	6	6	6
Bore and stroke	4½ by 5⅜	4¾ by 5⅜	4⅞ by 5⅜
Displacement in cu in.	512.9	572	602
Governed speed—maximum	2000	2000	2000
Bare engine hp at governed rpm	140	156.5	164.2
Torque—max in lb ft.	393	440	460
BMEP—maximum	116	115	115
Compression ratio—fuel oil	5.1 to 1	5.5 to 1	5.8 to 1
70 Octane gasoline	5.9 to 1	5.9 to 1	5.8 to 1
80 Octane gasoline and natural gas combined	5.9 to 1	6.5 to 1	6.2 to 1
Natural gas and butane	5.9 to 1	6.5 to 1	6.7 to 1
Weight of std. engine (incl. flywheel, housing and manifolds)	1670	1670	1670
Powerplant (incl. electrical accessories)	1815	1815	1815
Weight of open power unit (incl. electrical accessories)	2225	2225	2225
Weight of closed power unit (incl. electrical accessories)	2470	2470	2470

filter of 4 qt. capacity are standard equipment on all models.

Pistons are of aluminum alloy, the ring set-up consisting of three compression rings, an oil control ring, and an oil scraper ring, all mounted above the wrist pin. Wrist pins are full floating and held in place by lock rings at each end.

The cooling system incorporates a centrifugal pump of leak-proof design with the impeller mounted on two widely separated ball bearings. Coolant is directed, first, against the exhaust valve seats by means of an inlet header, then to other points in order of importance. Full length water jackets contribute to proper cooling of cylinder walls.

Timing gears are of helical type with wide face. Dry liners are offered as optional equipment on the Models R-6513 and R-6572.



Sectional view at top of R-600 cylinder showing installation of integral oil cooler and oil filter assembly

Classification and Inspection of

Castings for Airplanes

By M. A. Melcon

Structures Engineer,
Lockheed Aircraft Corp.

Table I—Casting Classification Class I, Vital Functions

A. Controls and mechanisms for
1. Flight control system
   a. Elevator
   b. Aileron
   c. Rudder
   d. Flaps
   e. Servo tab systems and irreversible portions of trim tab systems
   f. Varicam
   g. Boosters
   h. Control system pulleys
2. Hinge brackets for control surfaces
3. Landing gear retracting system
4. Landing gear downlock system
5. Brakes (excepting parking control)
6. Engine throttle

B. Supports and attachments for
1. Bombs
2. Externally carried cargo, bombs, etc.
3. Fuel and oil tanks
4. Mounts for inhabited turrets
5. Control surface balance weights
6. Cargo and ordnance hoisting, handling and securing provisions
7. Bunks and litters
8. Gun mounts (if breaking loose can injure gunner)
9. Safety belts
10. Seats and benches

C. Miscellaneous
1. Major fittings in which there are no alternate load paths
2. Valves for cabin supercharging

Note: 1. Models licensed by CAA — All castings having Class I functions shall be designated as Class I-A.

A NEW plan for quality control of castings for airplanes has been worked out at Lockheed. The plan has two phases—classification and inspection. For purposes of inspection and acceptance, castings will be classified solely by the function of the part in the airplane structure. This is done to insure maximum inspection of all castings vital to the safety of the airplane or its occupants.

Class I comprises vital castings that are defined as those the single failure of which would cause direct loss of the airplane, one of its major components, or its control, or which may cause direct serious injury to the occupants of the airplane. Class II, non-vital castings, are all those castings not placed in Class I as defined. Class II castings may or may not be important, but their function is not vital to the safety of the airplane or its occupants. Table I lists castings that are considered as Class I.

After the casting has been designed, critical (highly stressed) regions of the casting and the location where it may be impression stamped are designated on the engineering drawing. It is the responsibility of the structures engineer to specify these areas. An extensive statistical study has been made on the frequency with which various defects occur in castings. As a result of this study, it has been concluded that it is impossible to establish a universal, acceptable radiographic standard which will be structurally acceptable in the most critical area of the casting and, at the same time, not cause an excessively high rejection rate. In view of this, it was decided to establish critical and non-critical areas with corresponding radiographic standards for each.

The radiographic standards for acceptability of the critical areas are high and castings inspected to them are known to have had exceptionally fine service records. The radiographic standards for acceptability of the non-critical areas have been based on the statistical study mentioned and will result in a rejection rate which is economically feasible.

The amount of X-ray inspection required will be determined solely by the classification. Class I-A castings will be 100 per cent X-ray inspected. (For the military services only, some castings having Class I functions are designated as Classs I-B and given only 25 per cent X-ray inspection.) Class II-A castings will

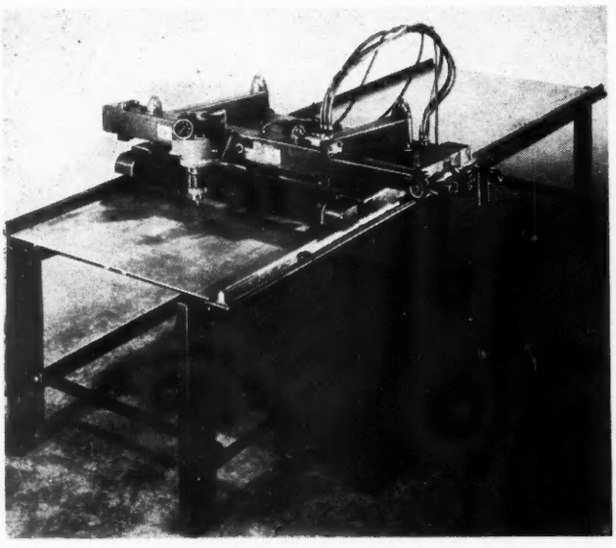
(*Turn to page 85, please*)

Table II—Casting Classification Class II, a Sampling for X-ray Inspection

Lot Size	Trial One N_1	Trial One C_1	Trial Two N_2	Trial Two N_1+N_2	Trial Two C_2
1- 3	3	0	—	—	—
4- 15	3	0	—	—	—
16- 50	5	0	3	8	1
51- 100	6	0	8	14	2
101- 200	7	0	7	14	2
201- 300	7	0	7	14	2
301- 400	7	0	7	14	2
401- 500	7	0	8	15	2
501- 600	8	0	13	21	3
601- 800	8	0	13	21	3
801-1000	8	0	13	21	3
1001 and more	8	0	14	22	3

N_1 = size of first sample
N_2 = size of second sample
C_1 = allowable rejects for first sample
C_2 = allowable rejects for first and second sample

New Production and Plant Equipment



Oxweld oxy-acetylene shape-cutting machine model CM-15-36

THE first postwar model of an Oxweld oxy-acetylene shape-cutting machine, the CM-15-36, is now in production at the Linde Air Products Co., a Unit of Union Carbide and Carbon Corp., 30 East 42 St., New York, N. Y.

The new machine has been designed to do precision cutting on work of intermediate size, which formerly could be done only with a large machine. For the first time on any Oxweld shape-cutting machine, an attachment is available for this machine which makes it possible to mount the blowpipes on both sides of the tracing table. This feature makes the machine particularly adaptable to high production setups by permitting the cutting of identical shapes simultaneously from plates on both sides of the tracing table. The attachment can also be used to advantage in eliminating "down time," since plates can be put into position on one side of the machine while cutting is being done on the other.

All types of shape cutting performed with larger machines are possible with this machine within its 36-in. transverse working range. The longtudinal working range with the standard table is 100 in. and this range can be extended indefinitely by adding frame and table top sections.

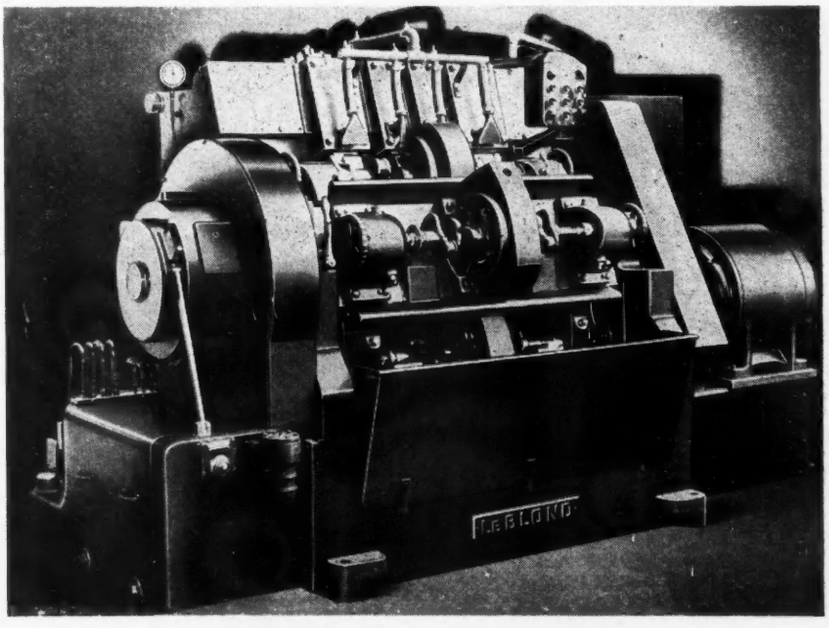
The carriage of the CM-15-36 is made of cast aluminum. Two free-moving pivoted arms mounted on the free-rolling carriage give blowpipe motion in any direction within the limits of the work area of the machine. The carriage travels on a track mounted on a table frame fabricated from structural members. A flat one-piece aluminum plate, 42 in. wide by 144 in. long, supported on the frame between the rails of the track, serves as a table surface upon which the drawing or templet to be traced is placed.

The tracing head is powered by a 110-volt universal motor. A simple eddy-current type speed governor gives an infinite variation of speed—from 3½ to 28 in. per min.—which is indicated to the operator on a speedometer.

The machine, as shipped, is equipped for either mechanical tracing with strip templet or hand-tracing. A magnetic tracing unit is available as an accessory for use when maximum precision in repetitive production shape-cutting is desired. Straight-line cutting guides and a circle-cutting attachment for automatically cutting circles 1½ in. to 36 in. in diameter, are supplied with the machine. The blowpipe holder may be tilted to an angle of 45 deg. from the vertical, to permit making bevel-cuts. By use of supplementary blowpipe holders, mounting bracket and bar two blowpipes may be mounted on the same side of the machine for simultaneous cutting of identical shapes.

PRODUCTION of automatic crankshaft lathes by the R. K. LeBlond Machine Tool Co., Cincinnati 8, Ohio, interrupted during the war, has now been resumed. The new LeBlond line is said to be more automatic and faster than the models produced before the war.

LeBlond's new line of automatic crankshaft lathes consists of: 6AC—2-spindle machine, built for simultaneously rough turning pin bearings on both spindles or simultaneously finish turning pin bearings on both spindles; 7ACL—single or double center drive for rough turning all line bearings in one operation; 1LB—single spindle, either single or double center drive lathe, with separate sets of tool units for simultaneously rough and finish turning all line bearings, flange and stub ends of crankshafts; DM—Four-station indexing machine built on the revolving drum principle for finish turning of line bearings. Eliminates completely all rough grinding operations. The addition of the fourth station, loading station, makes possible continuous uninterrupted operation of



LeBlond DM automatic crankshaft lathe

the machine without time formerly lost for loading and unloading.

Although there is some small overlapping of functions, these four machines complement each other and represent a line of automatic crankshaft lathes that perform all turning operations, such as rough and finish turning, filleting, cheeking and shaving.

SMALL basketed parts are cleaned in a new two-dip immersion vapor degreaser recently added to the line of standard metal cleaning equipment produced by Detrex Corp., 13001 Hillview Ave., Detroit 27, Mich. Designated a 500-C-1, the conveyorized machine permits a choice of any one of several cleaning cycles.

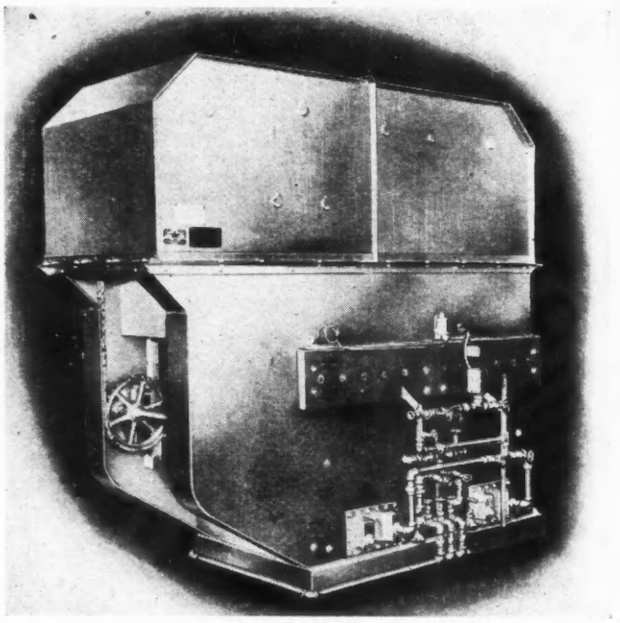
The type and degree of soil contamination is the deciding factor in the selection of the appropriate method of cleaning. The first choice is an immersion-vapor cycle. Work being cleaned is dipped in hot solvent in the first chamber and then is moved through vapor in the second.

A second selection is a vapor-immersion-vapor cycle. Here, the solvent level is held low in the first chamber allowing the accumulation of oils and grease as in a one-dip concentrator. The conveyor moves through hot solvent in the second chamber and then through solvent vapors in the final phase.

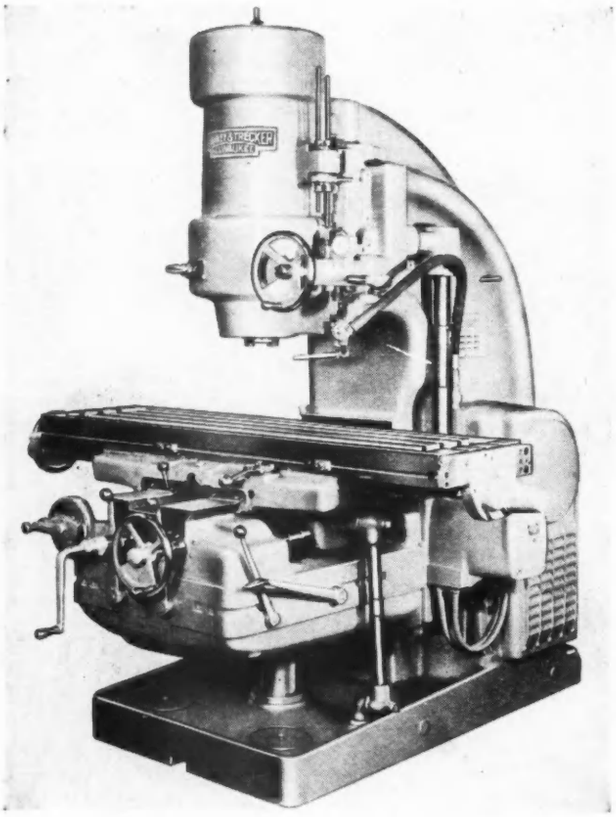
The boil-rinse-vapor cycle cleans the work in solvent at a boil temperature, at a rinse temperature and in the vapor. Some contaminants can be removed in vapor alone. These various phases can be recombined to form new cycles for special degreasing jobs.

The 500-C-1 is fabricated from 10-gage steel plate, reinforced with structural steel of all-welded construction. A water jacket condenser, tested for a working pressure of 40 psi, completely circles the machine. Beneath the condenser is a clean solvent collecting trough which carries the reclaimed solvent through a water separator to either the storage tank or the second chamber.

Work to be cleaned is loaded at one end of the degreaser, carried through the cleaning cycle, returned through the upper hood to the same end of the machine for unloading. The conveyor system is complete with the necessary sprockets, shafts, take-up device, speed reducer and vari-speed drive.



Detrex 500-C-1 immersion vapor degreaser



Kearney and Trecker CSM vertical milling machine

KEARNEY & TRECKER CORP., Milwaukee, Wis., announces the CSM line of knee-type milling machines. Horizontal and vertical models are available in 20-hp, 30 hp, and 50-hp sizes.

The massive solid-back column of the CSM has the spindle drive motor cross mounted in the base. Power is transmitted to the spindle through multiple V-belts and the spindle speed selection box. Sixteen quick-change speeds from 50 to 1250 rpm are in approximate geometrical progression. The spindle is provided with a center bearing spindle which reduces deflection eight times. A heavy flywheel is splined to the spindle and assures a uniform flow of power to the cutter.

A feed and rapid traverse drive motor mounted on the right side of the knee furnishes power to the table feed mechanism. Thirty-two quick-change feed rates from ⅜ in. to 90 in. per minute in approximate geometrical progression are provided. Climb cutting equipment is provided for the table.

C. F. PEASE CO., 2601 W. Irving Place, Chicago, Ill., has just brought out the Pease "88-R" printing and developing machine. This new dry direct process machine produces Whiteprints (dry direct process) in cut sheets or rolls, in one continuous operation at a speed of 30 fpm. All the operator has to do is feed in the tracings and sensitized papers, either cut sheets or rolls—virtually everything else is automatic. The finished prints are delivered in a matter of seconds.

Mechanical speed control of the machine is said to be instantaneous and positive. Maximum printing speed is assured by locating within the contact cylinder a 75 watt per in. high pres-

(*Turn to page 54, please*)

Hardman Motion Converter Eliminates Crankshafts and Connecting Rods

TESTS made by the National Bureau of Standards with the Hardman motion converter, a new mechanical movement that eliminates crankshafts, piston pins, connecting rods, etc., have proved the design inherently well balanced and basically sound according to a report issued by the Civilian Production Administration. The mechanism was developed during the war by James A. Hardman and the Utah Scientific Research Foundation.

The motion converter consists of the following essential elements whose motions change rotary motion to rectilinear, reciprocating motion or vice versa: (1) A reciprocator which travels in a straight line; (2) a shuttle mounted with bearings (capable of taking thrust) on the reciprocator; (3) two* rotors mounted on two shafts, which are in the same horizontal plane with the reciprocator and at right angles to it; (4) a ball and socket assembly (mounted in the rotors) which engages the rotors and the arms of the shuttle and (5) ring gears, mounted on the rotors, for driving a pinion, or driven by a pinion. The rotors, equally spaced from the axis of the reciprocator, are driven at equal opposite angular velocities. As the rotors revolve, the shuttle reciprocates in the direction of the axis of the reciprocator and at the same time oscillates in a plane perpendicular to the axis of the reciprocator. The reciprocative motion of the shuttle is transferred to the reciprocator through thrust bearings. As the shuttle oscillates, each of the arms slide simultaneously through holes in their respective spherical bearings, which are mounted in sockets located in the rotors. The centers of the spherical bearings are equally spaced from the reciprocator and rotor axis.

If the rotors revolve at constant angular velocity the motion of the reciprocator is simple harmonic, and if the rotors revolve at equal velocities in opposite directions, there are no force components acting at right angles to the axis of the reciprocator, provided that alignments are good. Since the direction of motion

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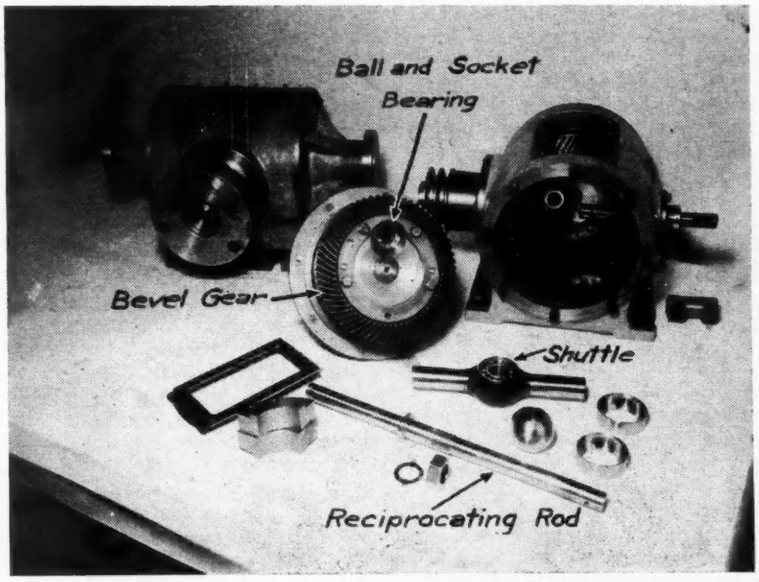
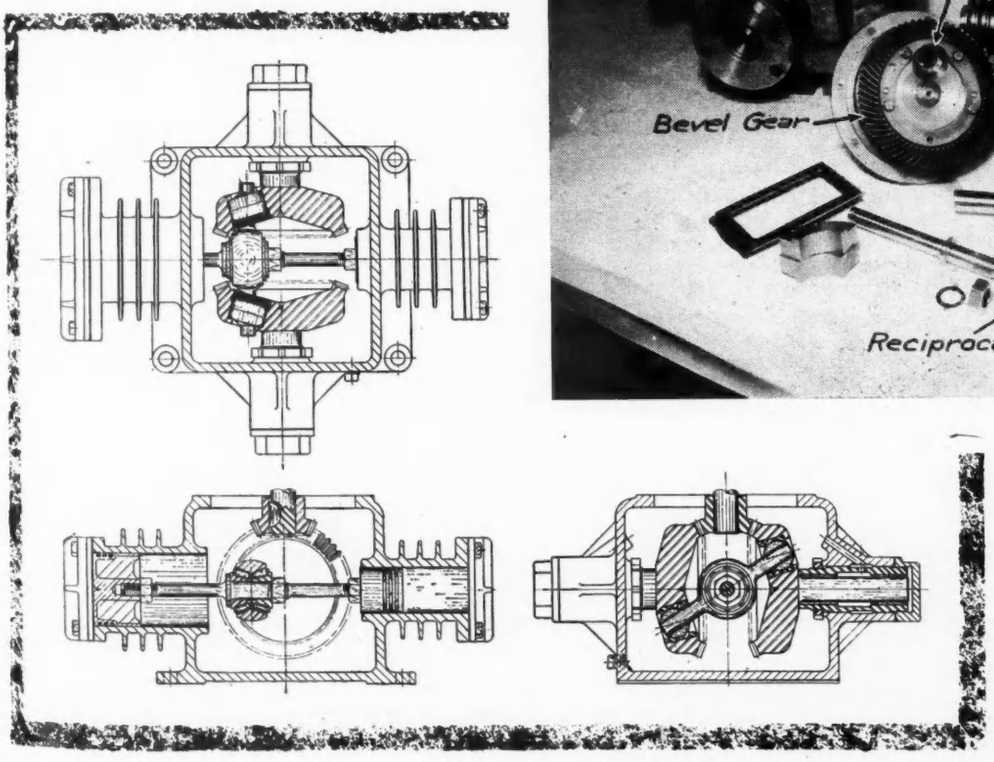
* The device may be constructed with only one rotor in which case the reciprocator would have force components acting on it at right angles to its axis.





A — Assembled Hardman test unit and disassembled parts of similar unit. They were designed to carry 50 hp at 3000 rpm and a reciprocating frequency of 1500 cycles per min, with a four-in. stroke.

B—Details of a two-hp air compressor utilizing new motion converter principles.

Observations

BY JOSEPH GESCHELIN

Plated Cylinders

WIDESPREAD use of porous chromium coatings on cylinder liners during the war, particularly for big engines for the Navy led to discussion of the desirability of adopting the technique for plating liners and cylinder barrels of commercial engines. Moreover, it has been reasoned that if aluminum barrels could be plated economically, it might be feasible to use aluminum cylinder blocks without steel liners for small engines. The results of inquiries made by the writer seem to indicate that the plating of inline blocks is still a somewhat expensive operation owing chiefly to the relatively long cycle—4 to 5 hr—for the deposition of a sufficiently heavy coating. However, if there is enough interest in the subject to encourage further research, an economic solution may be uncovered. One line of attack may be to determine the minimum thickness of coating required for civilian uses. Any reasonable reduction in thickness of coating would correspondingly reduce plating time, and therefore, cost.

Machinery Market

THE Conference Board Report—"Aftermath for Machine Tool Builders"—deals with the enormous pool of government owned machine tools to be disposed of under the provisions of the Surplus Disposal Act. With regard to that situation we are far from being pessimistic. Consider that much of the government owned machinery represents special and standard tools. Special tools do not lend themselves readily to the general run of production applications unless specifically designed for a given purpose. Standard tools, although widely used in all industries, are by no means the backbone of automotive production. Recognizing that in the post-war era increases in labor costs will require the development of new techniques, progressive manufacturers will find it imperative to seek new methods and new machinery of advanced type. True, some of this may be found in the government pool. But it is more than likely that the automotive industry again will prove to be the largest market for unit type machinery and special machinery and that this immediate demand will give the machine tool builders plenty to do.

Automatic Transmissions

ALTHOUGH the only automatic transmission offered in 1946 still is the Hydra-Matic, the industry is apparently closer to its widespread use than ever before. We make this statement in view of the amount of work now in progress which is bound to be translated into production units before long. Certainly, it is not too much to expect that more models of the 1947 vintage will offer automatic transmissions.

Short Liners

SEVERAL years ago C-W-C announced the development of a high grade centrifugally cast alloy liner for engine cylinder barrels to be used in very short length. The idea was to protect only the few inches at the top of the cylinder bore where the effects of corrosion were most marked. It is of interest to find that one of the most prominent engine builders has been experimenting with this principle and has found considerable success in initial installations. We look for a significant production application in the not too distant future.

Aluminum Bearings

SOME of the most striking developments in recent years have come in the field of sleeve bearings for the crankshafts and connecting rods of motor car and heavy duty engines. Since the war we have noted improvements in alloys as well as in the production methods. The wide use of silver alloy bearings for aircraft engines and for large engines also brought about the successful commercial application of protective surface coatings of Indium or Indium-lead which had been largely experimental before. The latest development along this line is the wider use of aluminum bearings—no longer in the experimental stage. Judging by laboratory and service tests conducted by the Aluminum Co. of America such bearings have demonstrated unique advantages for automotive engines. A critical design consideration in the attainment of high fatigue characteristics appears to be determination of the necessary certain thickness for any given engine.

On Reconversion

FROM the standpoint of ability to shift rapidly from war to peace, many parts makers had relatively inconsequential reconversion problems. For some, at worst, a moderate length of time was required. It was, therefore, assumed that complete reconversion in such cases has been achieved. Actually, many important parts makers not content with going back to what they had, have been engaged—if not closed by strikes—in a major program of building construction and new equipment installation. When they complete this job, it will not be business at the old stand, in the old way, but business on an improved manufacturing basis. This activity, although not widely publicized, is responsible for more buying of new machine tools than most people realize.

Small Cars

WHILE we have at the moment no publishable dope of an exclusive character regarding the details of what the industry will offer in the shape of 1947 models, it is worth mentioning here for a desirable degree of additional emphasis that the light cars contemplated by at least two and perhaps three of the leading manufacturers will not be small packages such as have been talked about in certain circles during recent years. They will be, instead, what may correctly be called full size cars—lighter, with shorter wheelbase and smaller engines —designed to sell under the lowest price models offered now by the same manufacturers.

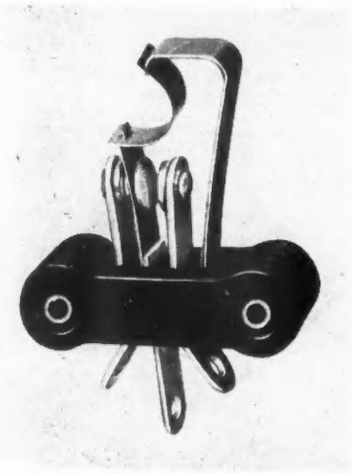
New Products

Flexible Bearings Eliminate Noise and Vibration

Torflex flexible bearings are being manufactured by Harris Products Co., 5113 Cowan St., Cleveland, Ohio, to eliminate the problems of noise, vibration, shock impact and lubrication. They consist of a tube or ring of rubber stretched longitudinally between two concentric metal sleeves which prevent the rubber from returning to its original state. The pressure exerted by the rubber on the metal sleeves insures a high capacity mechanical bond between the rubber and metal under all operating conditions. This method of manufacturing these bearings provides a mechanical rather than a chemical bond between the rubber and metal having a working shear load capacity of approximately 150 psi. According to the company, the bearings are free from wear, will transmit torque, compensate for parallel and angular shaft misalignment and require no lubrication. They come in a wide range of sizes, are simple and easy to incorporate in designs and to install.

Open Blade Snap Switch For Vertical Mounting

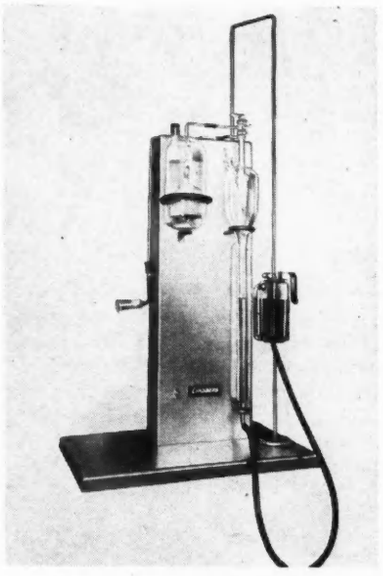
A small size, open blade, snap switch, Model M, has been brought out by Acro Electric Co., 1314 Superior Ave., Cleveland 14, Ohio, to fill the need for a compact, sturdy, popular priced switch which can be mounted singly or in multiples in a vertical position. Operating blade, center blade and the rolling spring are made of a heat-treated beryllium copper to withstand high capacity loads and to increase the life of the switch. Overall dimensions are approximately 1 13/32 in. by 1 1/64 in. by 5/16 in. The standard operating pressure is six to ten oz and the rating is 15 amp, 125 volts alternating current. The switch is furnished for single pole, normally open or normally closed, and double throw circuits.



Model M snap switch

New Features Aid Carbon Determinations

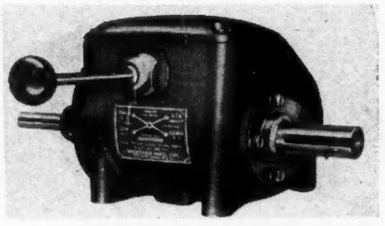
In order to produce faster, more accurate carbon determinations, the Lindberg Volumetric Type Carbon Determinator, manufactured by Lindberg Engineering Co., 2444 West Hubbard St., Chicago 12, Ill., introduces a number of new features. The burette mounted in front of a fluorescent light, permits a reading accuracy of one point of carbon or better. It is also water jacketed and graduated for one-gram and ¼-gram samples permitting full range use in analyzing the carbon in iron, steel, heat resisting steel, stainless steel and other materials. The absorption chamber permits complete absorption in two passes, and for many alloys, one pass is sufficient. The chamber combines the use of glass tubing and glass beads for gas dispersion. The special leveling bulb is held positively at any point by a friction clamp, and a micrometer screw provides the zero adjustment. Glassware is of Pyrex.



Lindberg carbon Determinator

New Industrial Transmission

Western Manufacturing Co., 3400 Scotten Ave., Detroit 10, Mich., is adding to its line a transmission adapted to flat plate or platform mounting. The case is provided with four bosses, drilled and tapped, so the transmission can be secured to a plate or flat portion of the machine on which it is to be mounted. This unit known as "9000 B Series," has a 5-hp capacity with an input speed of 900 rpm and four gear changes available through an automotive type shift lever. All gears and shafts are of heat treated alloy steel and the gears are lapped. Revolving shafts are mounted on anti-friction bearings and the case is oil sealed.

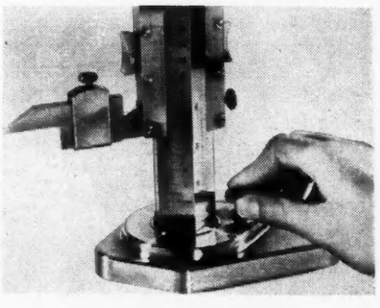


Western Transmission

Large Height Gage for Precision Measurement

A new 48 in. Chesterman height gage for the precision inspection, layout, scribing and checking of large size jigs, fixtures, dies and castings, has been added to the line of the George Scherr Co., Inc., 200 Lafayette St., New York 12, N. Y.

The 48 in. Chesterman height gage employs an extra large vernier measuring 2.45 in. long, as compared to the ⅝ in. vernier commonly used on conventional gages. The verniers which read to 1/150 of a mm on the metric scale may be quickly read without the necessity of removing the gage from the work. The graduations are made on a heavy triangular beam and the quick adjustment is obtained by press-



Chesterman height gage

ing two lugs. The fine adjustment appears in the base as illustrated. In addition to the new 48 in. size, the gage is manufactured in 12, 18, 24 and 40 in. sizes provided with both English and metric scales.

Automatic Recessing Handle For Automobile Door Lock

The Leonard Manufacturing Co., 3451 Glendale Blvd., Los Angeles 26, Cal., is introducing a new type door handle and lock for the modern automobile. The

Handle recessed in door panel with key-lock and ring below

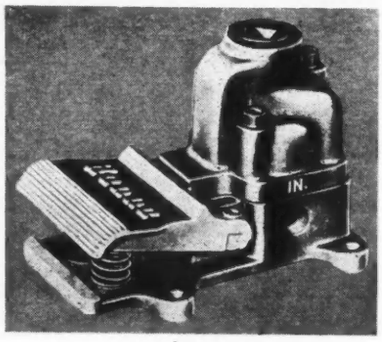
handle sets in a recess on the outside of the door, giving a smooth surface, as shown in the cut. Below the handle is the key-lock cylinder, which is surrounded by a ring. To release the handle from the recess, the ring is pressed lightly. When the door is closed, the handle will automatically return to the recess, remaining out only when the door is open. When the door is opened from inside the car, the handle remains in the recess. The company claims to have developed low cost prevention for lock freezing.

American Standard Spring Lock Washer

A recent development of the Reliance Division of Eaton Manufacturing Co., Massillon, Ohio, is a complete line of spring lock washers manufactured in compliance with the standards adopted by the American Standards Association, and known as American Standard spring lock washers. The product meets both ASA and SAE specifications.

New Valves for Air and Hydraulic Controls

First of a new line of valves for air and hydraulic controls are these three units designed by Hanna Engineering Works, 1765 Elston Ave., Chicago 22, Ill. One type is a packless ¼ in. capacity valve called Hanna Unitite Jr., for tubing and light piping applications. It is a smaller model of Hanna's standard Unitite valve. It is designed for four-way operation, but may be used as a three-way valve by plugging one part, and is suitable for air, oil, or water in pressures up to 250 psi. It is



Hanna Valves

available for manifold, column, or panel mounting.

The new Hanna foot-operated valve is a packless control for use in air and oil hydraulic cylinder applications. It is made in two styles—one, with single pedal for constant cycles of operation; and the other with a split pedal that holds position until tripped for reversal. Available in ⅜, ½, ¾, and 1 in. sizes, it operates on 250 psi air pressure or 1000 psi oil pressure.

Control of cylinder piston speed in both directions is accomplished by the Hanna two direction speed control valve. It provides for adjustable control of inflow and outflow of air or oil independently to and from one side of the piston. One valve is used for oil operation and two are recommended for air. Working pressures are 250 psi for air cylinders and 1000 psi for hydraulic. Pipe sizes available are ¼, ⅜, ½, ¾ and 1 in.

High Solids Synthetic Rubber Latex Produced

New products, improvements in old products, and an end to shortages created by the lack of natural rubber latex, are expected to result from the successful production of a high solids synthetic rubber latex by the Goodyear Research Laboratory, maintained at Akron, Ohio, by The Goodyear Tire & Rubber Co.

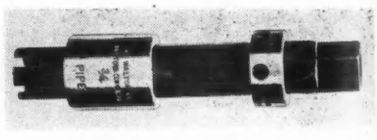
The synthetic latex is expected to find even larger uses than the natural material since it can be "tailor made" or "custom built." That is, its formula can be varied through a wide range to meet specific requirements. The synthetic latex is expected to find uses in the manufacture of rubber gloves and other dipped articles, insulation for wire and electrical devices, crepe rubber soles for shoes, adhesives, washable paints, and frothed rubber effusions suitable for the seats in automobiles, buses, airplanes, railway cars, etc.

Bronze Welding Rod Has Flux Coating

A flux-coated bronze welding rod for application by the oxy-acetylene process has been developed by the Linde Air Products Co., unit of Union Carbide and Carbon Corp., 30 E. 42nd St., New York 17, N. Y. Known as Oxweld No. 25M flux-coated bronze red, this new rod combines the properties of the Oxweld No. 25M bare bronze rod with correct fluxing. When the rod is made, it is precoated with flux in proper proportion to its size. This coating consists of Brazo flux plus a non-active binder that does not affect the weld. It adheres firmly to the rod, melting down into the molten puddle without burning off ahead of the rod. It is said the rod can be heated and bent without destroying the coating. In addition, the coating is not affected by weather conditions.

Tap Extractors for Pipe Taps

Designed especially for quick and easy removal of broken pipe-threading taps a group of ten new pipe tap extractors have been added as stock sizes by The Walton Co., 94 Allyn St., Hartford 3, Conn. These pipe tap extrac-



Walton Tap Extractor

tors are designed on the same principle as the Walton extractors for hand and machine screw taps.

These pipe tap extractors are immediately available for all sizes of pipe taps from ⅛ in. to 1 in. inclusive, for both regular and interrupted thread styles.

Miles Gemini Data

Dimensions

Span	36.17 ft
Length	22.25 ft
Height (tail down)	7.50 ft
Track	10.92 ft
Wing area (gross)	191 sq ft

Weights

Fully equipped	1910 lb
Pilot	160 lb
Passengers (3)	480 lb
Luggage	284 lb
Fuel (250 miles range)	130 lb
Oil	36 lb
Gross weight	3000 lb

Estimated Performance (at 2800 lb)

Maximum speed	150 mph
Cruising speed	130 mph
Rate of climb (sea level)	870 fpm
Distance to clear 50 ft (5 mph wind)	930 ft
Landing run (5 mph wind)	375 ft
Indicated stalling speed	35 mph
Maximum range (still air)	
(45 U. S. gal fuel)	520 miles
(75 U. S. gal fuel)	820 miles

Note: With maximum fuel load, for 820 miles range, payload will be reduced by 308 lb.

Production Resumed as Strikes End in Most of Industry

Real Answer as to When New Car Output Is Going to Hit Anticipated Peaks Lies with the Parts Industry

With the General Motors strike out of the way and production getting started again, the labor crisis has been passed in the automobile industry. It is true that there are spotty situations in the parts industry, but it is the opinion of industry men that from now on the supply picture will gradually improve.

There is no doubting that General Motors now will bring to bear all the pressure it can muster to hit peak production levels at the earliest possible date. After paralysis of four months, the company resumed production trailing far behind its principal competitors, but in the meantime has had time to build up a considerable inventory of materials and parts which it buys outside. Of course, the corporation is not too well off so far as supplies from its own divisions is concerned, with the exception of the electrical parts divisions which were out for only one month, since inventories at the time of the shutdown were negligible. However, it now appears that production will pick up fast and by perhaps June, G.M. should be turning out somewhere between 125,000 and 150,000 cars a month.

Studebaker Corp. is the first of the old line manufacturers to announce that 1947 models will appear this year. In an announcement late in March, Paul G. Hoffman, president, told dealers that production of 1947 models would start in 30 days.

The surprising part of the announcement is that it will include the Champion line in addition to the Commander. Studebaker got into production on the Champion only the first part of January and probably did not turn out more than 20,000 cars. Consequently, such a short run could not possibly have reached the break-even point, to say nothing of compensating for tooling costs incurred to get into production. Observers in Detroit, where most companies have either officially or unofficially indicated that they do not intend to introduce 1947 models this year, were not surprised that the Commander line is being produced as a 1947 model, but were puzzled as to why the Champion line is being closed down in the face of heavy demand in order to make the changeover.

So far, Studebaker has not indicated if or when its highest priced line, the President, will appear. However, there are reports, as yet unconfirmed by the company, that a lightweight economy car, such as Ford and Chevrolet are known to be working on, is under development. The general opinion in Detroit is that such light cars will be aimed primarily at the foreign markets, since previous experience in the United States shows that the public generally does not take to abbreviated versions of the more comfortable and higher priced standard automobile. Public acceptance here, according to one industry spokesman, probably will hinge on how high prices go on present cars.

Ford made rapid gains after resuming production early in March and had reached a postwar high by about the 20th of that month. On that date, it produced a total of 3067 vehicles consisting of 1675 Fords, 260 Mercurys, 49 Lincolns, 516 commercials (half-tons) and 567 trucks. However, projected schedules for April and May call for just short of 90,000 and 100,000 respectively, and by August production should be soaring sharply. The postwar goal of 7000 to 8000 cars and trucks a day may be reached by October and November, provided no shortages develop in parts and supplies.

Despite a noticeable trend toward a more cheerful attitude among car manufacturers, there is always a qualifying "if." The real answer to when production is going to hit anticipated peaks lies with the parts industry. There already have been wage settlements by many of the larger companies and some of the smaller ones, and it now is the opinion that the others will follow soon. The matter of prices still

(*Turn to page* 90, *please*)

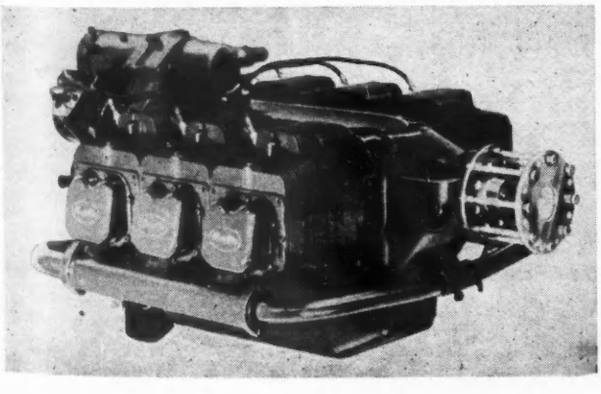
New Car Introduced by Ford in Canada

The new Monarch automobile, creation of Ford Motor Co. of Canada, Ltd., has recently been introduced to the public in Canada. The first new-name car to appear in that country since the war, the Monarch is powered by a 97-hp V8 motor and incorporates numerous ride control, braking and engine refinements, and will be an entry in the medium-priced field.

The company is also introducing a new line of trucks under the name of Mercury. This truck line will be in addition to the regular Ford truck line, and will comprise a range of models running from a half-ton pickup on a 114-in. wheelbase to a three-ton model with a 176-in. wheelbase. A special truck-tractor unit and a school bus chassis with a 194-in. wheelbase will also be offered.

With the introduction of the new line of trucks, and for the first time a full line of Mercury passenger cars, the company has created a new distribution division which will have exclusive sales rights on the Lincoln car and the Mercury line of cars and trucks. It will be known as the Mercury and Lincoln Division. The Ford line of cars, trucks, buses, and tractors and the new Monarch car will be handled by the Ford and Monarch Division, formerly the Ford Division. Each of the divisions will have its own branch offices and dealers throughout the Dominion.

The Franklin 335 Aircraft Engine



This six-cylinder, horizontally-opposed engine has 335 cu in. displacement, and produces 150 hp at 2600 rpm. Cylinders are one-piece aluminum with more than 7500 sq in. cooling surface. The special float-type carburetor has a manual mixture control, accelerator pump and idle-off; features customarily found only on larger engines.

Industry Offers Plan to Increase Exports of Motor Vehicles

Eighteen recommendations for the expansion of foreign trade around the Reciprocal Trade Agreement program were outlined by the Automobile Manufacturers Association. In a statement to Congress and government agencies interested in foreign trade policy, the AMA called for the "fullest use" of existing governmental powers to eliminate restrictive tariffs, quotas, exchange blocs and other "artificial barriers to the free movement of trade."

Pledging itself to seek equality of treatment for all motor vehicle manufacturers in foreign markets, the AMA recommended that the American Government ask foreign countries levying customs duties against motor vehicles to apply such duties on a value basis. Existing systems which make assessments on a weight basis, or other inequitable grounds, favor one type of vehicle as compared with another in the same price range.

The AMA recommended that in negotiating reciprocal trade agreements the State Department should encourage foreign governments to eliminate automotive import license systems and import quotas, and gasoline and horsepower taxes that hamper motor vehicle use abroad.

The AMA also asked that the Government terminate controls on export shipments of automotive products, "at the earliest date consistent with the purpose of American foreign policy."

In another series of recommendations, it is requested that treaties of friendship and commerce be concluded with foreign governments to give protection to American foreign traders and investors, and that foreign trade services of this country be extended and improved.

A number of recommendations suggest technical changes to facilitate automotive exports such as simplification of regulations covering export declarations, and adoption of uniform ocean bills of lading by American shipping companies.

In normal years the automobile industry is the principal exporter and importer among manufacturing industries in this country. One out of every ten American motor vehicles produced in 1937, for example, or a total of 272,503 passenger cars and 203,411 trucks valued at $383,874,000 were sold abroad. Approximately 51,000 persons or 10 per cent of all workers in the industry were employed in the production of these vehicles.

About 300 products, all relatively important, from 56 countries were imported into the United States before the war for the manufacture of motor vehicles. These include such items as rubber from the Straits Settlements and the Dutch East Indies; tin from Malaya and Bolivia; chrome ore from South Africa; asbestos and nickel from Canada; and kapok from Sumatra.

AMA Will Sponsor Progress Exhibit

The Automobile Manufacturers Association will sponsor an automobile exhibit in Detroit, June 1-8, in connection with the golden jubilee celebration of the automobile industry. The show will include cars ranging from the most ancient vintage obtainable to the latest models. The display is being called an automotive progress exhibit, rather than an automobile show, since it reveals the progress of more than five decades in automobile design.

NAM Registers Opposition to Fulbright Patent Bill

The National Association of Manufacturers has registered opposition to the bill introduced by Senator Fulbright (D. Ark.) and recently approved by the Senate Committee on Commerce. NAM believes that this measure (1) would severely interfere with industry's efforts to develop any devices and processes which can actually be put into use; (2) gives unusually wide powers to the Secretary of Commerce; (3) provides for an expenditure of the taxpayers' money on many items of doubtful value; (4) places industry promoted items at a disadvantage with those sponsored by the Government; and (5) competes with private research organizations and industrial research departments.

The Fulbright bill, the NAM contends, contains activities which overlap with other proposals before Congress and, if enacted, would create confusion and difficulty for business in general.

Technical Section Opened by International Nickel

The International Nickel Co., Inc., announces the opening of the Empire State Technical Section of its Development and Research Division as of April 1. It will be located in the Genesee Valley Trust Building, Exchange and Broad Streets, Rochester 4, N. Y., and will furnish technical information and assistance to industry in the State of New York excluding New York City, the Albany area, and the Hudson River Valley.

New Canadian Plant for Studebaker Production

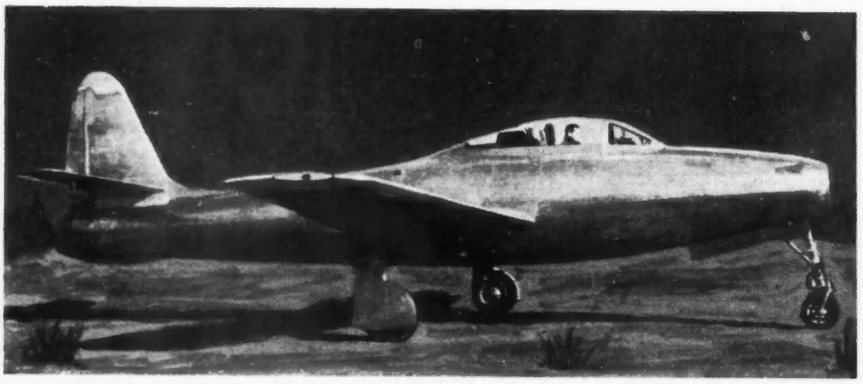
Studebaker Corp. recently purchased one of Canada's largest war plants, located in Hamilton, Ontario, for the manufacture of passenger automobiles and trucks. Manufacturing operations are expected to begin in the near future, and new equipment will be installed in the plant as soon as it is available. Wholesale distribution in Canada, as well as manufacturing, will be handled at Hamilton.

The plant was built by the Canadian government in 1940 to produce antiaircraft guns and has over 300,000 sq ft of floor space. Clearances are ample for heavy handling equipment and office space of more than 30,000 sq ft is provided by a second floor over some of the manufacturing area. Future expansion is possible on the vacant property adjoining the plant. The new site contains about 20 acres of ground, and is convenient for either rail or water shipments and drive-aways to the major Canadian markets.

Packard Continues Work on Aircraft Jet Engines

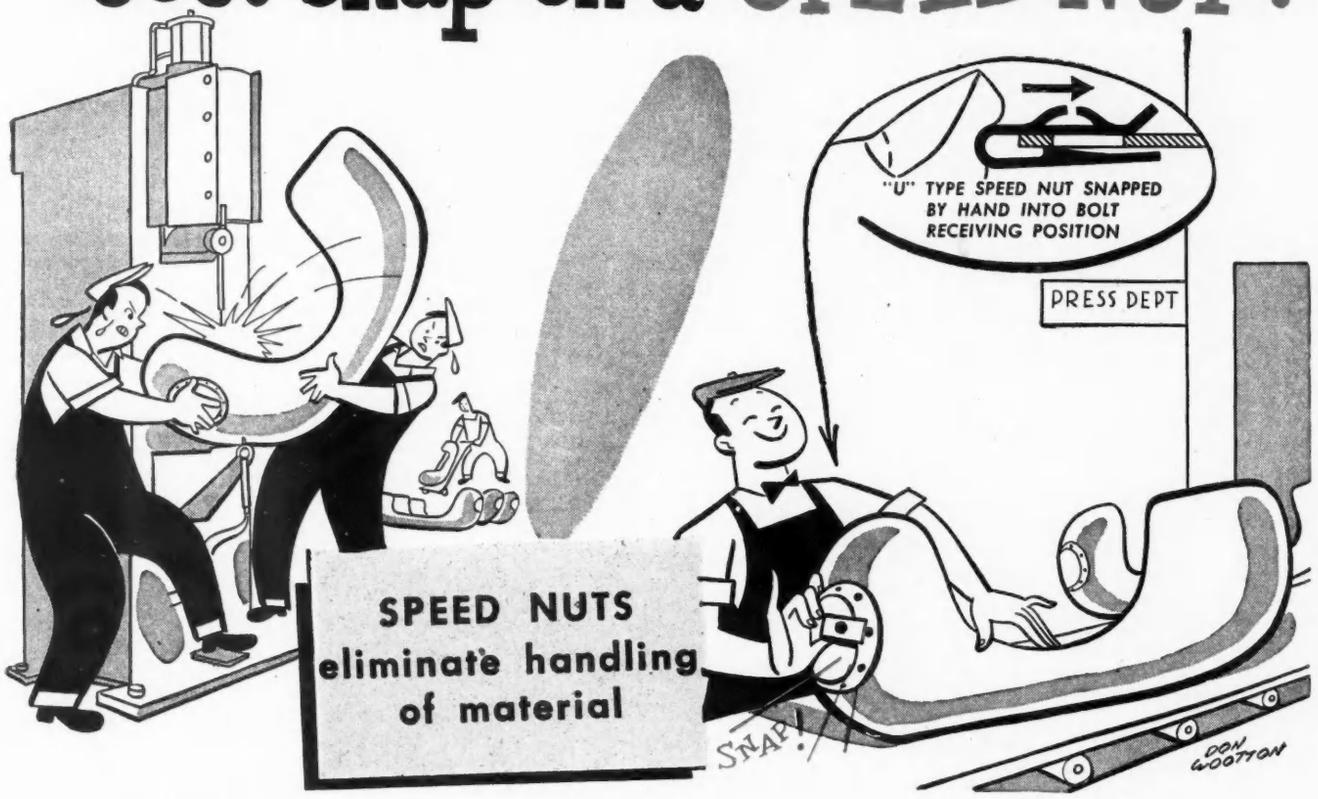
Packard Motor Car Co. is continuing experimentation with jet propulsion aircraft engines under government contract. The work, started during the war, is being carried on at Packard's Toledo plant and at the Willow Run air base. Packard has developed a small marine engine and also has orders for a considerable number of 1800-hp marine engines of improved design. The automotive line has been expanded to include taxicabs, business cars, and chassis for ambulances and hearses.

Republic XP-84 Jet Fighter



Republic Aviation Corporation's newest, the XP-84 jet fighter, which has joined the Army Air Forces lineup of new aerial weapons by successfully completing its first test flight at Muroc Field, Calif. The plane is powered by a new axial flow General Electric jet unit. Performance data are still classified as secret.

Why do it the hard way ?
Just snap on a SPEED NUT !


"U" TYPE SPEED NUT SNAPPED BY HAND INTO BOLT RECEIVING POSITION
PRESS DEPT
SPEED NUTS eliminate handling of material
SNAP!
DON WOOTTON

A SPEED NUT CASE HISTORY

One car builder used four welding machines to attach cage nuts on fender stampings for head lamp assembly. Three men were needed for each machine . . . one hauled stampings from the press department and two more wrestled the stampings and located them in fixtures on the welder. Because of all this handling, stampings were frequently damaged. And after painting, threads had to be retapped.

Changing to self-retaining Speed Nuts radically reduced the costs of this operation! Two men now do this work on a conveyor and quickly snap the Speed Nuts into place by hand. We will be glad to give you complete details of this case history on request.

* * *

In Canada: Wallace Barnes Co., Ltd., Hamilton, Ontario
In England: Simmonds Aerocessories, Ltd., London
In France: Aerocessoires Simmonds, S.A., Paris
In Australia: Simmonds Aerocessories, Pty. Ltd., Melbourne

Time was when the only way to fasten a nut in place for blind location assembly was to weld, rivet or clinch a cage nut over the bolt hole. This anchored the nut . . . but man, what a job it was!

Changing to Speed Nuts really simplifies this type of operation! Effort is reduced to a fraction — hands freed for more productive work. Welding machines eliminated. Less floor space needed. And, there is less handling and easier final assembly. You get all this *plus* a better finished product because the spring tension lock of Tinnerman Speed Nuts *prevents vibration loosening.*

There are many types of self-retaining Speed Nuts . . . all designed to drastically reduce the cost of blind location fastening. Let us show you how they can be used on your product to effect really worth-while savings. Send in your assembly details today!

TINNERMAN PRODUCTS, INC.
2059 FULTON ROAD • CLEVELAND 13, OHIO

Speed Nuts* PATENTED

MORE THAN 3000 SHAPES AND SIZES

*Trade Mark Reg. U. S. Pat. Off.

FASTEST THING IN FASTENINGS

PUBLICATIONS AVAILABLE

Publications listed in this department are obtainable by subscribers through the Editorial Department of Automotive and Aviation Industries. In making requests give title above the item concerning the publication desired, the date of issue in which it appeared, your name and address, company connection and title.

Special and Hydraulic Machinery

Hydraulic Machinery, Inc.—8-page brochure describing the company's engineering, laboratory and production departments and illustrating typical examples of special production equipment, and hydraulic machinery, in addition to test equipment and hydraulic power units.

Stainless Tubing Slide Chart

The Carpenter Steel Co., Welded Alloy Tube Div.—Slide Chart for the calculation of velocity flow and capacities of heat exchangers. Contains information and data on areas of tubes, a pressure table, table of weights for round stainless steel tubing and information on physical properties of the principal grades of Carpenter Stainless Tubing. Specifications are given on various sizes and gauges in which the tubing is supplied.

New Cullman Publications

Cullman Wheel Co.—Catalog No. 9 illustrates and describes the various models made by the company, gives diagrammatic drawings and specifications. Also included are general information, prices and dimensions of flexible couplings and sprockets. Illustrated folder showing Cullman Machine Tool Drive installations. Descriptions, prices and specifications of the various drives are also included. Catalog No. 21, 80 pages, covering general information, specifications, prices on the various types of sprockets manufactured by the company and including tables on Recommended Maximum Bores and RPM's of Sprockets and Roller Chains; Determining Length of Chains; HP for Roller Chains; HP for Silent Chains; Hub Diameters for Roller Chain Sprockets; Maximum Bores for Roller Chair Sprockets; Pounds of Tension on Driving Chains; Speed of Chain in Feet per Minute; Sprocket Diameters—Bottom, Outside and Pitch; Standard Limits of Bores and Eccentricity and Sprocket Forms.

Electrolytic Equipment

The Electric Products Co.—Bulletin 202 describes and illustrates the various models of motor generators designed for electrolytic processes. Space is given to panels, automatic and semi-automatic, and to other products designed and built by the company.

Tru-Stop Brakes

American Chain & Cable Co., Inc., Automotive and Aircraft Div.—16-page catalog giving up-to-the-minute details about the air-cooled brake for trucks and buses. Detailed drawings and photographs show the construction of the brakes, how they operate, adjustments of the brake and details of the aircooled disc. Comparative costs and wear data are given.

Carbide Tools

Metro Tool and Gage Co.—6-page catalog presents the complete description of Metro Standard Carbide Tools and Masonry Drills. Specifications and prices are included.

Worm Gear Speed Reducers

The Cleveland Worm & Gear Co.—A pictorial bulletin in colors describes the applications of worm gear speed reducers to various types of mixing and grinding equipment. It contains photographic illustrations featuring installations of worm gear units. Specific mixing and grinding operations include crushing, screening, agitating and polishing. Standard Cleveland drives are illustrated in connection with typical installation views, with a description of the Speedaire fan-cooled unit recently brought out by the company.

Guide Post Bushings

Ampco Metal, Inc.—Bulletin 80 describing Ampco Guide Post Bushings, a new line of aluminum bronze bushings. Sizes are listed and prices given.

Gas Atmospheres

Surface Combustion Corp.—12-page bulletin containing information on the preparation and applications of the various types of atmospheres used in the heat processing of metals. Included is a discussion of the Why, What and How of prepared atmospheres, the nature of the constituents of the various atmospheres, the effect of each and the combinations used. This information is summarized in a new 2-page table indicating the numerous applications of the atmospheres in such heat treating operations as carburizing, carbon restoration, etc.

Universal Gear Checker

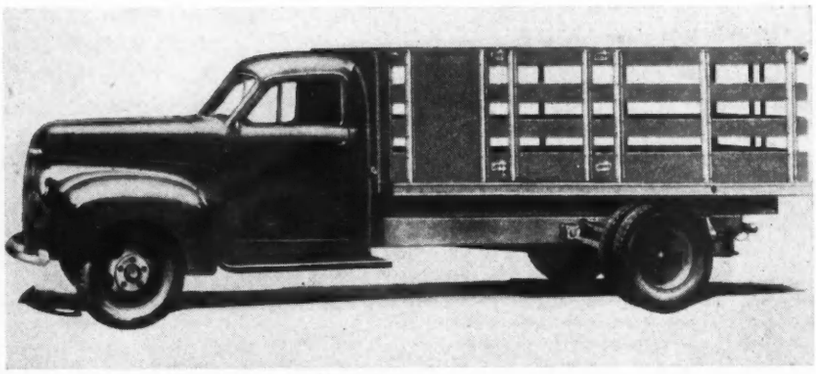
National Broach and Machine Co.—A fast and accurate method of checking dimensions, index or tooth spacing, helix angle and wobble, eccentricity and lead for all types of gears, is explained by text and illustration in a new 16-page equipment booklet.

Family Cabin Planes Produced by Fairchild

The first Fairchild F-24 cabin plane manufactured since the war, recently was completed in Dallas, Texas. The high-wing monoplane, which has four seats and dual controls, is one of the first "family planes" produced by any company for postwar civilian use. The planes are being built by a sub-contractor, the Texas Engineering and Manufacturing Co., in the former North American Aviation plant at Grand Prairie.

The 1946 F-24 is a deluxe version of the pre-war model. A Ranger 175-hp, six-cylinder inline engine gives it a top speed of 133 mph and a cruising speed of 118 mph. With a Warner 165-hp, seven-cylinder radial engine the top speed is 132 mph and cruising speed 117 mph. It is in the medium price class and equipped with instruments for all-weather flying. The range is 620 miles.

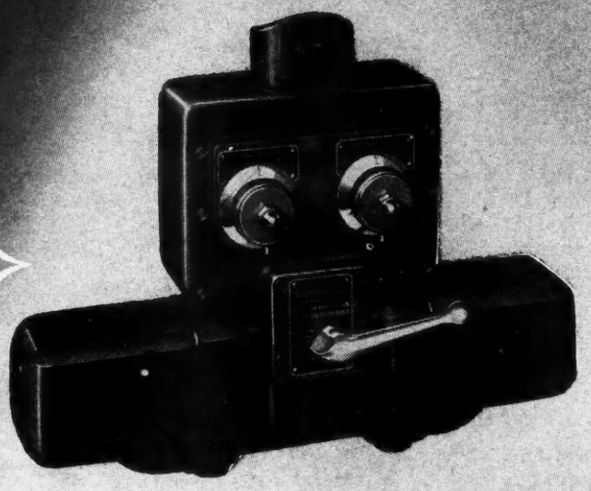
New Studebaker Medium Truck



Largest of the new 1946 Studebaker trucks is this one and one-half ton model with a six-cylinder engine and a four-speed transmission. It is available in three wheelbases of 128 in., 152 in., and 195 in., and has a maximum gross rating of 13,500 lb when supplied with standard heavy-duty rear axle and 15,000 lb when supplied with an optional two-speed rear axle with power shift. In tractor-trailer service, the maximum gross ratings are 22,000 lb and 24,000 lb respectively. Chassis are made to take 9-ft and 12-ft bodies, and an 18-ft to 20-ft school bus body. All models mount eight-ply 7.00 x 20 front and dual rear tires as standard equipment.

SMOOTH and CONSTANT FEED RATE

regardless of fluctuations in work resistance or hydraulic operating pressure



Double Solenoid Type
Push-button Operation

VICKERS "Traverse and Feed Cycle" CONTROL PANELS

These panels provide self-contained, compact control units for automatic machine applications where the cycle is a combination of rapid advance, one or two feeds, and rapid return motions. The two feed rates are infinitely variable within their ranges, and adjustments can be made during feed. Applications include drilling, reaming, boring, turning, milling and swaging machinery.

The hydraulic circuit in the panel employs the well-known Vickers Flow Control Valve in a "metering-out" circuit which means a smooth and constantly maintained feed rate for any given adjustment regardless of fluctuations in cutting tool resistance or changes in hydraulic operating pressure.

Simplicity is evident from the fact that there are only two working parts that move. Many standard modifications are available; feeds can be in either direction or both directions; operation is by single or double solenoids integral with panel, separate solenoids or pilot pressure. Practically any cycle sequence can be obtained. See Bulletin 41-10 for complete information.

Vickers Application Engineers will gladly discuss with you how "hydraulics" can be used to your advantage.

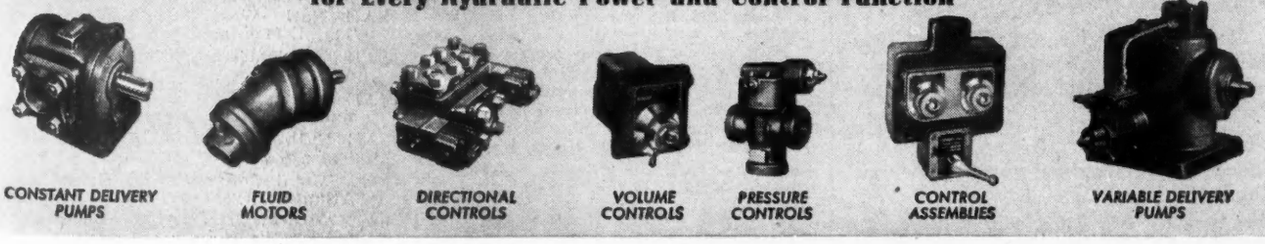
VICKERS *Incorporated*

1428 OAKMAN BLVD. • DETROIT 32, MICHIGAN

Application Engineering Offices:

CHICAGO • CINCINNATI • CLEVELAND • DETROIT • LOS ANGELES
NEWARK • PHILADELPHIA • ROCHESTER • ROCKFORD • TULSA • WORCESTER

Representative of More than 5,000 Standardized Vickers Units for Every Hydraulic Power and Control Function



CONSTANT DELIVERY PUMPS | FLUID MOTORS | DIRECTIONAL CONTROLS | VOLUME CONTROLS | PRESSURE CONTROLS | CONTROL ASSEMBLIES | VARIABLE DELIVERY PUMPS

PERSONALS

General Motors Corp., Chevrolet Motor Div., **C. P. Fisken,** Advertising Manager, has resigned.

Chrysler Corp., **F. W. Misch,** appointed Assistant Comptroller.

General Motors Corp., GMC Truck & Coach Div., **William E. Horton,** appointed Atlanta Manager for the GMC truck organization.

Willys-Overland Motors, Inc., **Edwin J. Otte,** appointed employment manager.

Packard Motor Car Co., **Henry Whiting,** resigned as manager of Detroit Zone for Packard.

Kaiser-Frazer Corp. and Graham-Paige Motors, **J. W. Alexander,** appointed Asst. Service Manager.

Northrop Aircraft, Inc., **Richard W. Millar,** elected Vice-Chairman of the Board of Directors; **John Westcott Myers,** Vice-President in Charge of Sales and **A. C. Morgan,** made Assistant Secretary.

Beech Aircraft Corp., **Willard S. Paul,** appointed Production Manager.

Sperry Corp., **Dr. Jerome Clark Hunsaker,** elected a director.

Autogiro Co. of America, **David E. Lukens,** made engineering representative.

Sun Oil Co., Refinery Supply and Distribution Div., **Donald Lincoln,** Manager, Marcus Hook Refinery Div., **Clifford Johnson,** Asst. Supt. in charge of maintenance and construction, **John E. Lilley,** Chief Construction Engineer and **Vaughn S. Whitesell,** Chief Maintenance Engineer, Manufacturing Dept., **Howard B. Sheppard,** made Project Engineer. **A. Cyril Daldy,** has joined the Public Relations Staff at the Philadelphia office.

Westinghouse Electric Corp., **David W. R. Morgan,** appointed General Manager of the entire South Philadelphia Works.

Sterling Aluminum Products, Inc., **Nelson W. Wainwright,** appointed Sales Engineering Manager.

Bendix Aviation Corp., Pacific Div., **Palmer Nicholls,** Vice-Pres. and group executive in charge of Pacific Div. and West Coast Bendix, **Mel M. Burns,** General Manager of Pacific Div. **R. C. Fuller,** General Sales Manager of new West Coast Div.

The General Tire & Rubber Co., **Howard Dodge** appointed head of new department of mechanical and industrial products.

Norma-Hoffman Bearings Corp., **Theodore G. Hughes** named Factory Manager.

Hall-Scott Motor Car Co., **W. E. Henderson,** Vice-President and acting General Manager.

United States Rubber Co., **Walter F. Spoerl,** General Sales Manager of Mechanical Goods Div.

Adel Precision Products Corp., Clin-

(*Turn to page* 88, *please*)

Business in Brief

Written by the Guaranty Trust Co., New York, Exclusively for AUTOMOTIVE *and* AVIATION INDUSTRIES

General business activity has maintained an upward trend. The *New York Times* index for the week ended March 9 stands at 128.2, as compared with 126.1 for the preceding week and 141.7 a year ago.

Sales of department stores, as reported by the Federal Reserve Board, for the week ended March 9 rose slightly to a total 14 per cent above the corresponding distribution in 1945, as against a like advance of 19 per cent recorded for the week before.

Electric power production during the same week registered a moderate decline. The output was 11.1 per cent below the comparable amount last year, as compared with a similar recession of 10.6 per cent reported for the preceding week.

Railway freight loadings during the week ended March 9 totaled 786,202 cars, 0.5 per cent more than for the week before and 2.5 per cent above the corresponding number a year ago.

Crude oil production in the same week averaged 4,403,350 barrels daily, 322,900 barrels less than the average for the preceding week and 7 per cent below the comparable figure in 1945.

Bituminous coal and lignite production during the week ended March 2 totaled 12,540,000 net tons, slightly less than the output in the week before but 11 per cent above that a year ago. The production thus far reported in 1946 is 3.1 per cent above the corresponding quantity last year.

Civil engineering construction volume reported for the week ended March 14 by *Engineering News-Record* is $74,769,000—9 per cent more than the preceding weekly figure and 83 per cent greater than the amount registered a year ago. The eleven-week total shown for 1946 is $733,440,000, or 132 per cent more than the comparable sum in 1945. The increase shown for private construction is 380 per cent, and the advance in public projects is 12 per cent.

The wholesale price index of the Bureau of Labor Statistics for the week ended March 9 rose to 108.2 per cent of the 1926 average, as compared with 107.6 for the week before and 105.1 a year ago.

Member bank reserves increased $219,000,000 during the week ended March 13. Underlying changes thus reflected include a rise of $126,000,000 in Reserve bank credit and a decline of $111,000,000 in Treasury deposits with Federal Reserve banks, accompanied by a reduction of $11,000,000 in money in circulation.

Total loans and investments of reporting member banks declined $449,000,000 during the preceding week. A rise of $76,000,000 in commercial, industrial and agricultural loans was recorded. The sum of these business loans, $7,458,000,000, shows a net increase of $1,260,000,000 in twelve months.

Obituary

Joseph W. McLean, for 44 years associated with the Simonds Saw and Steel Co., died in Philadelphia on March 7, from an extended illness which began shortly after his retirement on Nov. 1, 1945 as president of Simonds Abrasive Co. of Philadelphia.

N. Clif. Hilton, executive manager of the Abrasive Wheel, Diamond Wheel and Bowling Ball Departments of Raybestos-Manhattan, Inc., Manhattan Rubber Division, Passaic, N. J., died March 14, in Glen Ridge, N. J.

J. Donald Roach, 44, Gray-Rock service engineer, died March 19 at his home in Silver Springs, Pa. He had been associated with United States Asbestos Division since early in 1933.

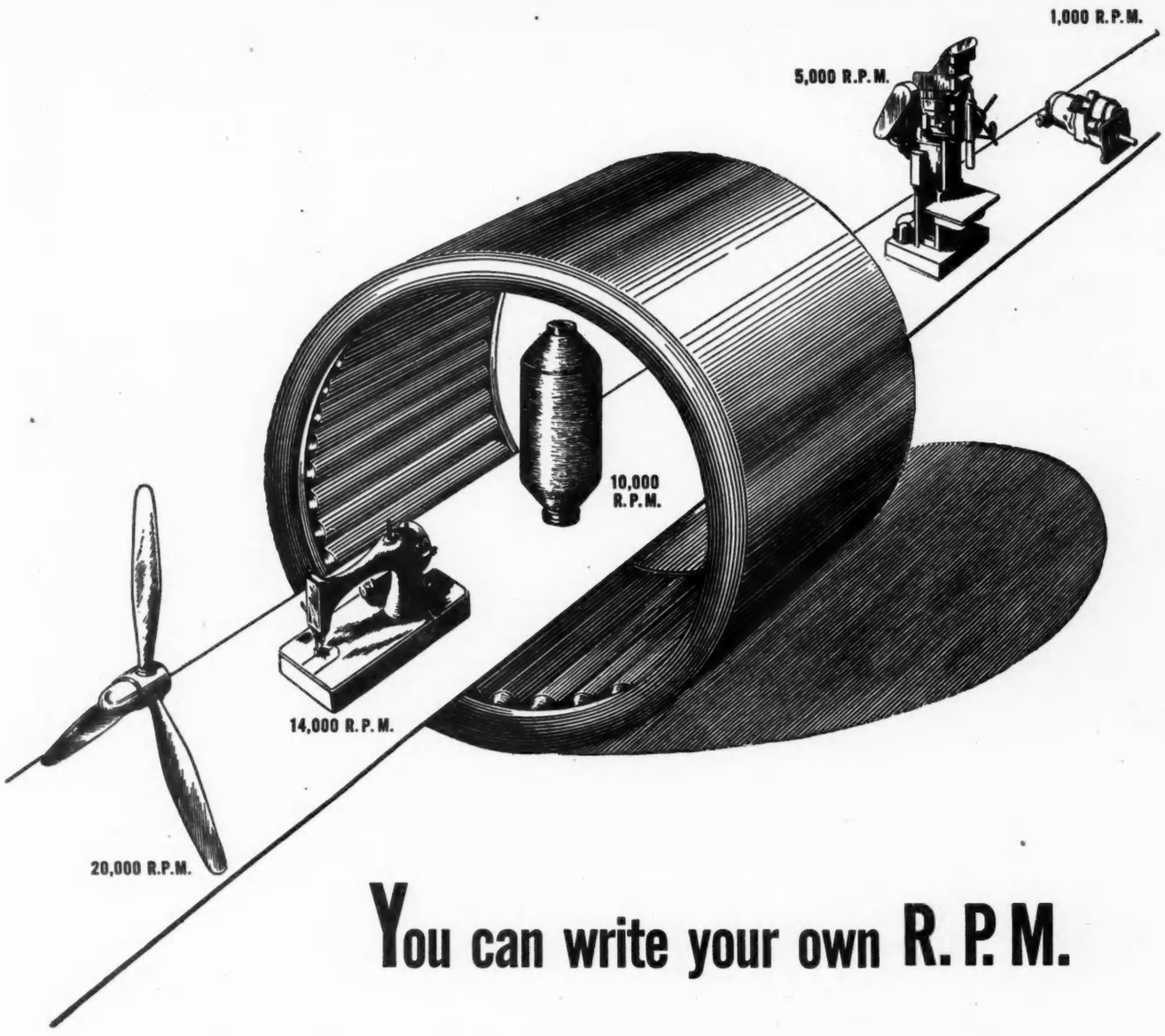
Checker Cab Co. Building Low-Cost, One-Ton Trailer

Checker Cab Co., Kalamazoo, Mich., is in production on an inexpensive one-ton trailer which is being distributed through one of the major national chain stores. This trailer is said to retail for about $200 and is being built on the trailer production line developed during the war for the production of Army trailers.

CALENDAR

Conventions and Meetings

Amer. Soc. of Mechanical Engineers—Spring Meeting, Chattanooga	Apr. 1-3
American Management Association, Atlantic City, N. J., Packing Exposition	Apr. 2-5
SAE Natl. Aeronautic Meeting, New York, N. Y.	Apr. 3-5
Midwest Power Conference, Chicago	Apr. 3-5
American Society of Tool Engineers, Cleveland Tool Engineers Exposition	Apr. 8-12
Natl. Plastics Exposition, New York City	Apr. 22-27
International Lighting Exposition, Chicago	Apr. 25-30
The Chamber of Commerce of the United States — Annual Meeting, Atlantic City	Apr. 30-May 2
Natl. Assoc. of Corrosion Engineers, Kansas City, Mo., Annual Meeting and Convention	May 7-9
Associated Business Papers, Hot Springs, Va., Spring Meeting	May 22-25
Indianapolis Motor Speedway Race, Indianapolis	May 30
SAE Summer Meeting, French Lick, Ind.	June 2-7
Amer. Soc. of Mechanical Eng.—Detroit	June 17-20
SAE Natl. West Coast Trans. and Maint. Meeting, Seattle	Aug. 22-24
SAE Natl. Tractor Meeting, Milwaukee, Wis.	Sept. 11-12
SAE Natl. Transportation and Maintenance Meeting, Chicago	Oct. 16-17
SAE Natl. Fuels & Lubricants Mfg., Tulsa	Nov. 7-8
Natl. Metal Congress and Exposition, Atlantic City	Nov. 18-22
SAE Natl. Air Transport Engineering Mfg., Chicago	Dec. 2-4



You can write your own R.P.M.

It's a fact...there is no practical speed limitation on the application of Torrington Needle Bearings. It is necessary only that the proper provisions be made for lubrication and precision assembly normally applied for high speed operation.

Torrington Needle Bearings have been employed commercially in rotating applications at speeds in excess of 20,000 r.p.m. with complete success. In addition, in one test installation Torrington Needle Bearings were operated at a speed of 50,000 r.p.m. for more than *three years* and showed only negligible wear.

Thus, if you are seeking higher speeds as one means of increasing product efficiency, you can virtually write your own ticket for practical operating speeds in so far as the use of Needle Bearings is concerned. This advantage—plus the low cost, compact size, high capacity, efficient lubrication and ease of installation of these modern, anti-friction units—is accounting for their increasing use in many fields.

If you are not completely familiar with many of the ways in which Needle Bearings are being utilized in your own industry, our Catalog 32, which will bring you up to date on practical Needle Bearing applications, is also an excellent source book for much engineering data. Your copy will be sent upon request.

THE TORRINGTON COMPANY
TORRINGTON, CONN. • SOUTH BEND 21, IND.
Offices in All Principal Cities

TORRINGTON NEEDLE BEARINGS

New Production and Plant Equipment

(*Continued from page* 42)

sure mercury tube which not only produces the proper type of light for rapid printing but emits the light in an even flow over the full width of the tube. An alzak reflector, to utilize maximum light value produced, also serves as a

Peace printing and developing machine

variable light shutter for controlling the printing speed.

The principal feature of this cylinder printer is the optional use of revolving or sliding contact. The advantages of both methods of contact—sliding and revolving—are now available for the first time. A clutch lever, which allows the operator to instantly convert from revolve to sliding revolve in which the cylinder runs slightly faster than the tapes, does the trick.

The contact cylinder is cooled by the same blower which forms the vacuum to convey exposed prints to the ammonia fume developer. After exposure the tracings are stacked in a receiving tray after falling onto the tape conveyor. Tracings are never confined to close quarters, sharp bends, etc., which injure the edges.

A foot treadle allows tracings and paper to be withdrawn easily and without damage. Finished prints can be delivered at front or rear, instananeously, by means of a lever at the front of the machine.

THE Howard Engineering & Mfg. Co., 2260 Buck Street, Cincinnati 14, Ohio, is the producer of a new type cleaning machine. It is a special-purpose machine for cleaning seam-welded rear axle housings of scale which is formed on the interior near the welds.

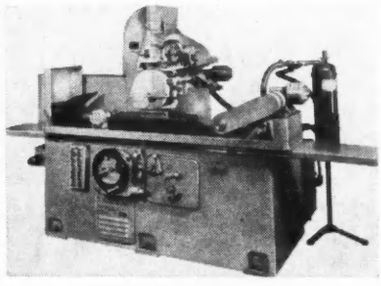
In operation, the axle housing is conveyed through the machine on a belt with an indexing arrangement that stops the housing at one station where a revolving steel brush enters the housing to brush loose the scale. At the same time cleaning solution is fed through and around the brush as well as on the exterior of the axle, flushing away the scale and other foreign matter. At the second station, the housing is dried with hot air.

The conveyor belt of the machine incorporates fixtures that hold each axle housing in the correct position during both the brushing and drying operation. Operation of the brush into and out of the housing is accomplished by an air cylinder operated in conjunction with the indexing of the belt.

TWO master rolls are now provided on Thompson Truform grinders, made by the Thompson Grinder Co., 1534 W. Main St., Springfield, Ohio, which speed the production of precision flat form contours.

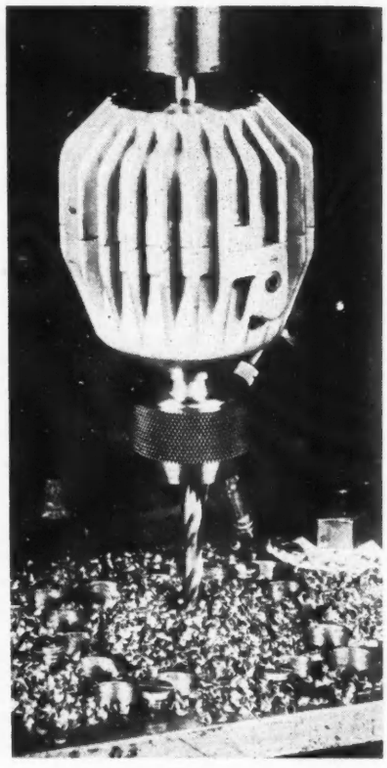
One roll, the work roll, does the initial crushing and truing. The second roll, the reference roll, spindle mounted on the opposite end of the table, is used for touching up the wheel and correcting form loss.

The grinding wheel, which has been touched up on the reference roll, is run at grinding speed against the work roll, thus re-processing it right on the machine without disturbing the set-up or removing anything.



Thompson Truform grinder

By means, the work roll can be reground whenever it loses form and can be used for hundreds of additional dressings, or until it is worn out.

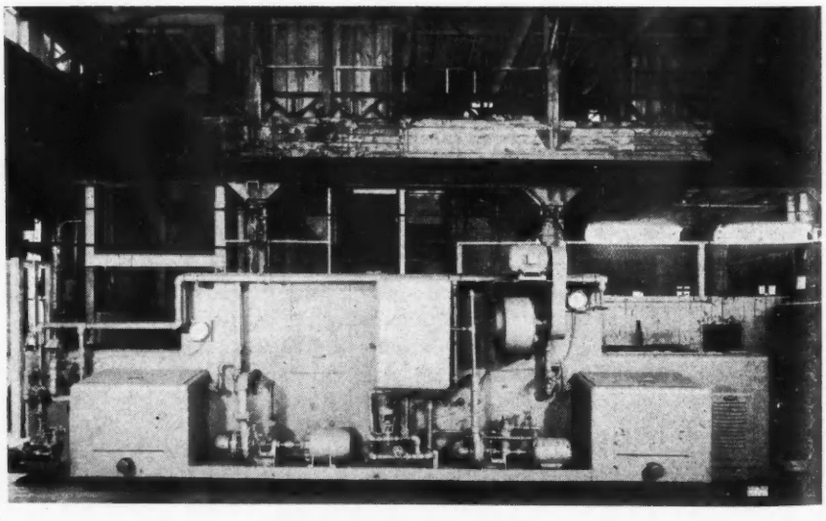


Ex-Cell-O drill chip breaker

AN IMPROVED drill chip breaker, which breaks the chip at each revolution of the drill, is introduced by the Ex-Cell-O Corp., 1200 Oakman Blvd., Detroit 6, Mich. The unit breaks chips into uniform, small pieces that are easily carried up the flutes of the drill. Main benefits are said to be increased operating speed and prolonged drill life.

In operation, the short chips simply accumulate around the mouth of the hole, eliminating the long, whirling spirals which would otherwise be thrown around the machine and on the floor by the revolving drill. If the work requires coolant, it flows on the

(*Turn to page* 56, *please*)



Howard cleaning machine

(Advertisement)

The CONE AUTOMATIC MACHINE COMPANY

sees many

GOOD THINGS AHEAD

It is reported that . . . . . .

Silicone oils, suitable for use in aircraft hydraulic systems, that will flow at 120 degrees below zero and do not oxidize at 302 above, have been developed in the General Electric Laboratories.

get ready with CONE for tomorrow

Relatively weak, soft strands of cotton fibre (roving) are impregnated with resin by a new process developed by Walter Kidde & Co. The yarn resulting is said to be stronger than one of the same size made in the conventional manner.

get ready with CONE for tomorrow

Spark plugs with electrodes that grow with use instead of wearing away are a recent contribution of the electrical engineering department of Yale University.

get ready with CONE for tomorrow

Alcoa's Cleveland Works test aluminum castings to destruction by centrifugal force in an armored pit. Parts are turned up to 25,000 r.p.m. in a partial vacuum.

get ready with CONE for tomorrow

The National Bureau of Standards sees the end of the octane system of evaluating motor fuel and suggests a leaded triptane-neptane scale to be known as a "detonation index".

get ready with CONE for tomorrow

Baldwin Locomotive Works have completed a locomotive for the Seaboard Railway that uses two 1,500-horsepower diesel engines with electric drive in a single unit instead of the usual two or more coupled units.

get ready with CONE for tomorrow

By comparing the magnetism produced in a sample with standard specimens of known hardness, the new magnetic hardness tester made by General Electric tests parts too small for mechanical hardness gages.

Nitric oxide can now be made by an efficient, simple and inexpensive method developed in the chemical laboratories of the University of Wisconsin.

get ready with CONE for tomorrow

Said to be the hardest in the world are the new vitrified bonded diamond wheels made by Norton Company.

get ready with CONE for tomorrow

A new kind of small, powerful magnet is made by General Electric of iron and cobalt oxides and is not itself a conductor of electricity.

get ready with CONE for tomorrow

Ford's new foundry method is to bring the molds to the molten metal.

Pyrene is equipping diesel-electric locomotives with carbon dioxide extinguishers that will detect and put out fires inside or underneath them.

get ready with CONE for tomorrow

Jack and Heintz state that their new Skinner gasoline engine will be the first die-cast engine ever produced.

get ready with CONE for tomorrow

The new small tractor that Allis-Chalmers is expected to introduce will push its tools instead of pulling them. Price is expected to be under $400.

get ready with CONE for tomorrow

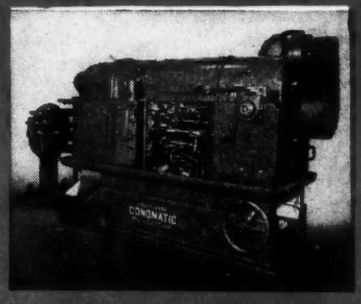
American Gas & Electric Service Corp. announces plans to set up a 500,000-volt transmission line in Ohio to experiment with the sending of ultra-high voltages.

get ready with CONE for tomorrow

Two-way conversation between moving trains is undergoing a three months' test at the Wayne Junction Yard of the Reading Railroad.

Exclusive with CONE

In making this Transmission Shift Rail of NE 8620 on the 1⅝" 8-spindle Conomatic in 32½ seconds, the stock is fed out approximately 7" in the first position for turning, forming, center drilling, chamfering and threading. In the fifth position the stock is fed out to full length and the piece is broken down and severed from the bar in the last three positions. This double stock feed is an exclusive feature on 8-spindle Conomatics and makes possible twin setups on many jobs.



Ask your CONE representative to show you our new color motion picture

CONE

AUTOMATIC MACHINE CO., INC. ★ WINDSOR, VERMONT, U.S.A.

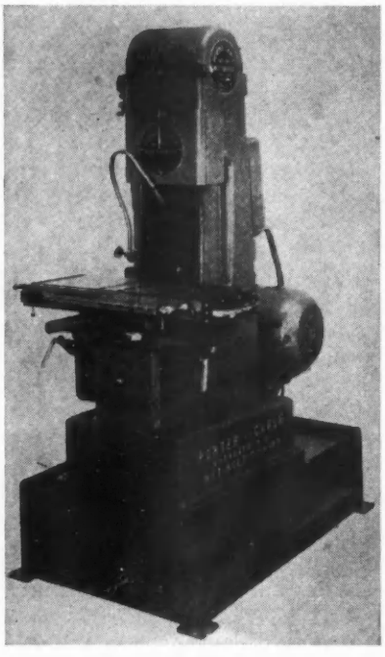
27

work and down the drill flutes, past the short loose chips to the point of the drill without splashing.

The Ex-Cell-O drill chip breaker can be used vertically, horizontally, or at any angle at which housing can be kept stationary while the drill rotates. An arm is provided to prevent rotation of the housing. Where space permits, the Ex-Cell-O drill chip breaker can be used in multiple spindle heads.

AN IMPROVED wet belt surfacer which surfaces, grinds and removes stock by means of an abrasive belt and incorporates features which greatly increase its output, is the latest addition to the line of the Porter-Cable Machine Co., Syracuse 8, N. Y. The wet belt surfacer, Model BG-8, is said to offer high production, close tolerance performance and superior finish.

The new model BG-8 wet belt surfacer



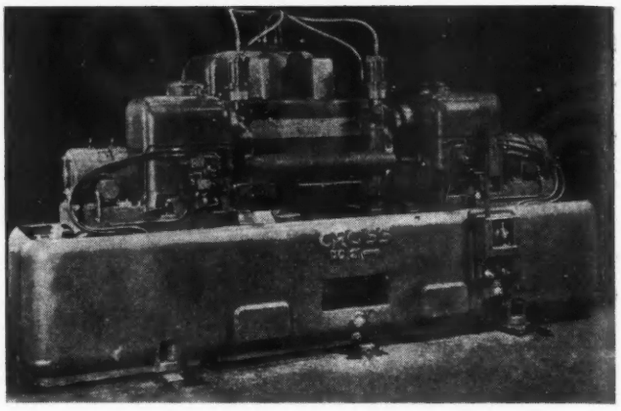
Porter-Cable Model BG-8 wet belt surfacer

is equipped with a larger capacity recirculating tank for longer operational performance. The coolant, applied to work and belt with a spray nozzle, maintains the work in constantly cool condition and prevents weakening of the structure of certain kinds of materials: plastics, rubber, ceramics, glass and tempered metals.

The depth of the machine has been reduced from 62½ in. to 48 in. to conserve space. The work table of the new BG-8 measures 38 in. from the floor in contrast to the previous distance of 40½ in.

A flat, hardened steel platen is used to back the belt during the grinding operation. Platens (standard size) are 9 in. by 12 in. The working area of the standard table is 17½ in. by 11¼ in. An abrasive belt 8 in. or 9 in. wide by 107 in. in circumference can be used.

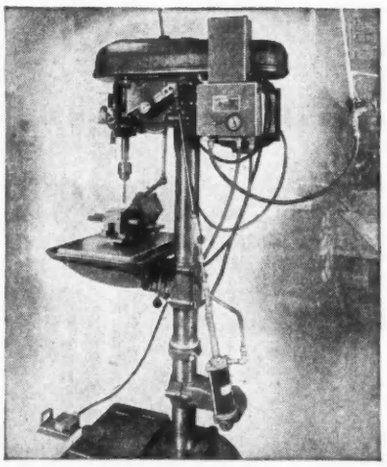
Resilient platens can be used on the new model BG-8. Such platens are used when the surface to be ground need not be perfectly flat or parallel with other surfaces; they are also used when surfacing or grinding concave or convex surfaces.



Cross facing and centering machine

A LOW voltage (24V) Electro-Air control which permits conversion of standard machine tools and fixtures to automatic or semi-automatic production units by pneumatic control of machine or fixing movement has recently been offered to the trade by the Electro-Air Devices Co., 2811 W. Fletcher St., Chicago, Ill.

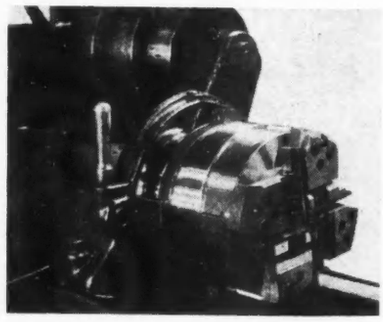
The manufacturer states that the control may be used with any standard air cylinder and can be furnished to provide either single or multiple cycle control with the addition of cycle timing, hesitation limit switches, etc., to perform a wide variety of operations such as automatic drilling, tapping, milling, indexing, and holding. Advantages claimed for the control are: Compact design, which permits mounting anywhere on the machine without hindering operator movement or vision; absence of close-fitting ports or valves, which may tend to wear after long periods of service, low voltage employed; flexible application—easy and quick installation anywhere on any machine or fixture with wide control of cylinder stroke; rapid control of any push or pull motion provided by high speed action of solenoid-operated needle valves.



Electro-Air control applied to drill press

THE Cross Co., Detroit, Mich., has designed and manufactured a universal machine for facing and centering shafts in sizes from 1¼ in. to 6 in. diameter by 9 in. 48 in. long. In this design cutting rigidity is attained by supporting both the work, regardless of length, and the cutters at the point of cut. The machine operates in a full automatic cycle controlled by push button; the shafts are rolled on loading rails into the clamping jaws and hydraulically clamped on each end; the work then feeds up to mill both ends; the carbide cutters retract and the work lowers for centering and unloading. Fifty average shafts are faced and centered on both ends in one hour. The hydraulic feeding and traversing heads connected with the work clamps are quickly and easily positioned to change from one size shaft to another.

LANDIS MACHINE CO., Waynesboro, Pa., has added a new series of



Lanco Type VV die head

Lanco hardened and ground die heads to its present line. Heretofore, hardened and ground die heads of the Lanco type have been available up to the ⅞ in. size. The new series identified as the Type VV is available in the 1 in., 1½ in., 2 in. and 2½ in. sizes for use on hand operated threading machines.

The chaser holders of the Type VV Lanco hardened and ground die heads are clamped to chaser holder slides of

(*Turn to page 60, please*)

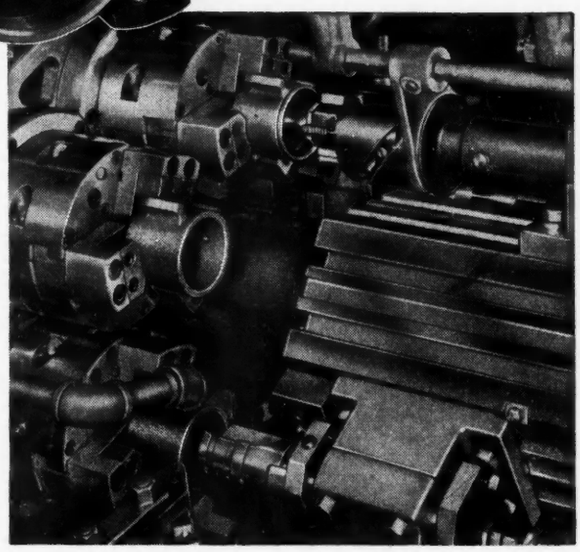
. . . HERE'S ANOTHER

Houdaille Malleable Iron
Shock Absorber Housing

The inside surface of this shock absorber housing must be within a specified tolerance of .002" at all points. This requires not only preservation of accurate diameter, but absolute squareness of the end surface with the cylinder.

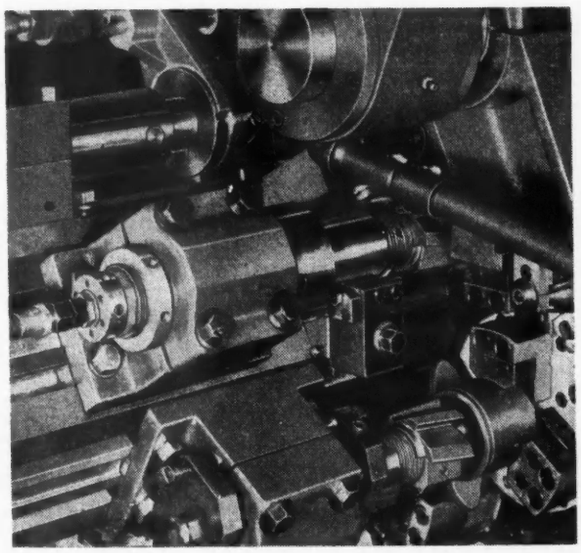
The remarkable feature of the operation is that Houdaille* turns this part out in 29 seconds, from rough casting to finished piece on a battery of New Britain Model 675 Multiple Spindle Automatic Chucking Machines . . . *with no finish grinding required.* The production of 122 pieces per machine per hour, day-in day-out is an ideal instance of how the speed and accuracy of New Britains combine to give you the utmost in production and low cost per piece.

*Pronounced—Hoo-dye



FRONT VIEW

Entirely open end construction provides accessibility for simplified chucking, cutting tool and attachment setup.



★

REAR VIEW

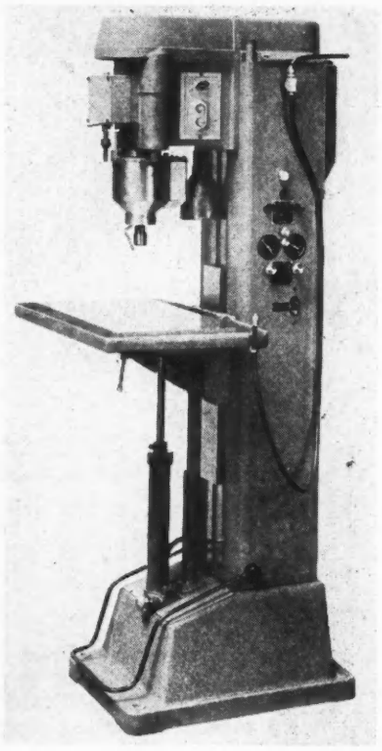
Wide open end construction provides extra large chip space . . . accessibility from three sides and from above that permits excellent visibility and easy tool adjustment.

New Britain builds a complete line of Multiple Spindle Automatic Chucking Machines . . . four, six and eight spindles up to 12" capacity . . . Also a complete line of Multiple Spindle Automatic Screw Machines to 2¼" capacity.

heavy cross section to assure maximum rigidity. The manner in which the chaser holders are clamped to the holder slides permits the removal of the holders from the face of the head for interchange without disassembling any part of the head or removing the head from the spindle.

The chaser holder slides are gibbed to the head body to provide compensation for wear. Zerk type fittings are provided to force heavy grease into the chaser slides and other operating parts to prevent the entry of fine cuttings which would cause excess wear. Extremely fine adjustment for size with the Type VV Lanco head is obtained by means of a graduated adjusting ring at the rear of the head. Size adjustments to the fraction of a thousandth can be obtained.

R. G. HASKINS CO., 615 So. California Ave., Chicago 12, Ill., offers a new line of electric air controlled tapping machines. This universal machine offers several methods of control and fixture application. By means of the panel switches on the side of the pedestal, the operator can select any one of three methods of cycle control. With selector switches at one postion he may utilize piece part, whereby the insertion of the part into the fixture actu-



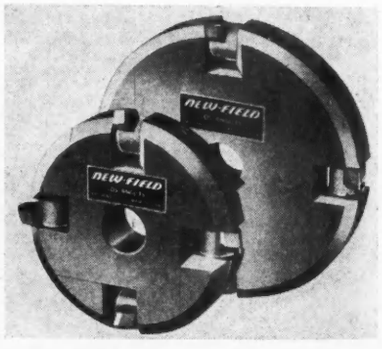
Haskins tapping machine

ates the complete down and return stroke of the tap head. By turning the switches to the second position, the operator can control the cycle at all times. Regardless of the position of the tap head, release of the foot pedal allows its instantaneous return to the top of its stroke. With the selector switches in still a third position, the operator may obtain a complete tapping cycle through momentary contact of the foot pedal.

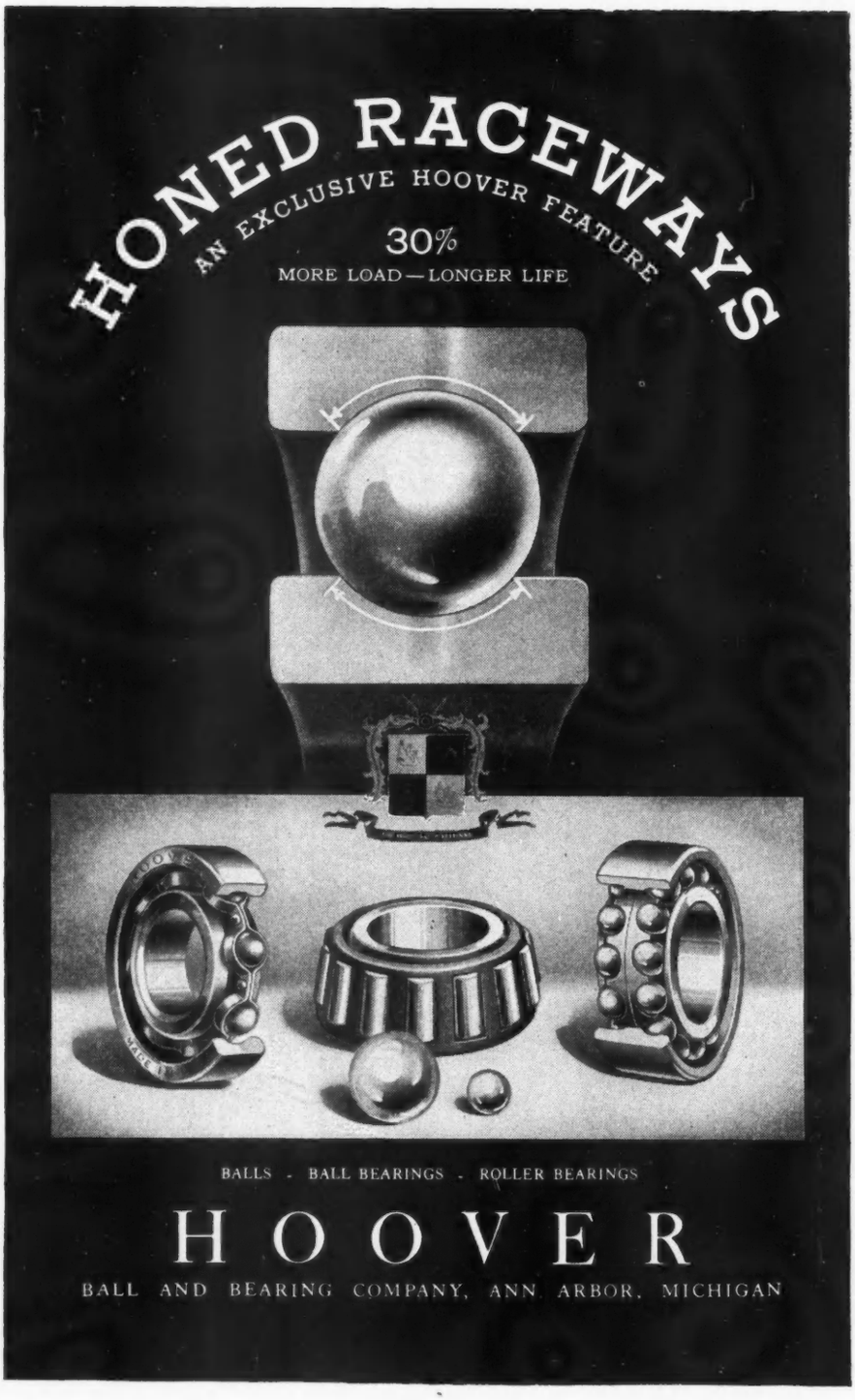
Machines are available in three sizes, the No. 1-UT, with a rated capacity of No. 2 to 3/16 in. in mild steel; No. 2-UT, with a capacity of No. 6 to 5/16 in., and No. 3-UT with a capacity of No. 10 to ⅜ in. N.F.

Two extra heavy models of the New-Field universal fly cutter have been designed especially for application on shell end mill arbors by the New-Field Machined Parts Co., 549 W. Randolph Street, Chicago, Ill. They are 1⅝ in. thick, 6 in. and 8 in. in diameter, allow-

(*Turn to page 62, please*)



New-Field universal fly cutter



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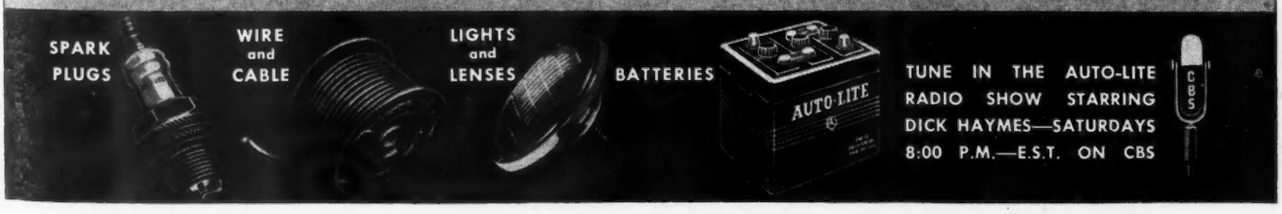
Leading automotive engineers pay tribute to the outstanding dependability of Auto-Lite products by specifying more than 400 Auto-Lite parts as standard equipment for finest cars, trucks and tractors. Such acceptance proves money cannot buy better products. Built in 24 great Auto-Lite plants these units include spark plugs, instruments, wire and cable, headlights, bumpers, plastic ornaments and panels, and complete electrical systems. A new booklet gives a more complete list of the many products Auto-Lite builds, alphabetically arranged for quick reference. Your copy will be mailed on request.

THE ELECTRIC AUTO-LITE COMPANY

Sarnia, Ontario — Toledo 1, Ohio



TUNE IN THE AUTO-LITE RADIO SHOW STARRING DICK HAYMES—SATURDAYS 8:00 P.M.—E.S.T. ON CBS

ing ample strength for machining driving slots and counterbores. Like other models they use 4 removable high-speed steel or carbide bits. They provide stock milling cutters with a wide variety of applications without the necessity of having many special cutters on hand. They are provided in all standard arbor sizes which can be machined to fit any individual arbor.

BAILEY METER CO., 1050 Ivanhoe Rd., Cleveland 10, Ohio, is introducing a simplified attachment for machine tools. It is a combined air and hydraulic system which may be attached to engine lathes, turret lathes or vertical boring mills to produce work pieces with contours which exactly correspond to a thin metal templet or master part.

Simplification has been achieved by applying a single hydraulic power cylinder to the lathe compound, which is usually set at 45 deg. to the longitudinal axis of the work. When mounted at this angle and used in conjunction with the standard longitudinal feed, the single power cylinder controls both longitudinal and in-out tool motion. The new attachment in no way hinders

Bailey duplicating attachment

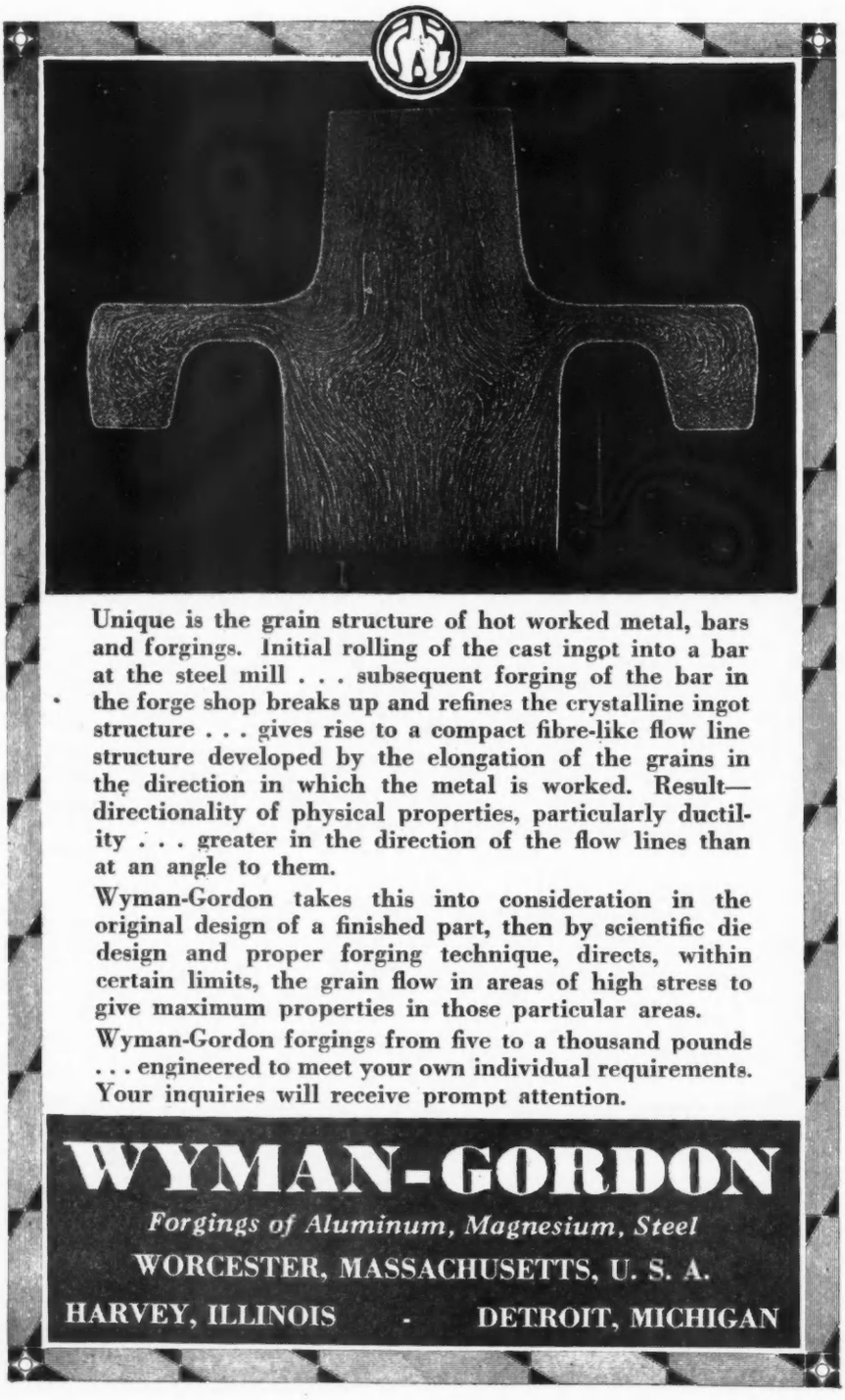
normal use of the machine to which it is applied. The standard controls for speeds, feeds and depth of cut funtion equally well with or without the attachment.

The Bailey duplicating attachment is said to provide automatic sizing of tapers and radii and to eliminate the necessity of taking numerous repetitive measurements. After the machine operator has made the initial setup and tool adjustment, no further attention is required on his part other than to load and unload the machine.

BRADFORD MACHINE TOOL CO., Dept. 1Z, 657 Evans St., Cincinnati 4, Ohio is now manufacturing a complete line of Metal Master electrical tools. The Bradford Metal Master grinder illustrated is a new design and incor-

Bradford Metal Master grinder

porates the following features; extra heavy duty motor, oversize ball bearings, semisteel guards made to meet American Standard and Safety Code, push button station with starter having overload protection and under voltage release, waterpot, tool tray, and spark breakers.


Unique is the grain structure of hot worked metal, bars and forgings. Initial rolling of the cast ingot into a bar at the steel mill . . . subsequent forging of the bar in the forge shop breaks up and refines the crystalline ingot structure . . . gives rise to a compact fibre-like flow line structure developed by the elongation of the grains in the direction in which the metal is worked. Result—directionality of physical properties, particularly ductility . . . greater in the direction of the flow lines than at an angle to them.
Wyman-Gordon takes this into consideration in the original design of a finished part, then by scientific die design and proper forging technique, directs, within certain limits, the grain flow in areas of high stress to give maximum properties in those particular areas.
Wyman-Gordon forgings from five to a thousand pounds . . . engineered to meet your own individual requirements. Your inquiries will receive prompt attention.
WYMAN-GORDON
Forgings of Aluminum, Magnesium, Steel
WORCESTER, MASSACHUSETTS, U. S. A.
HARVEY, ILLINOIS - DETROIT, MICHIGAN

Light Metals give your product new selling features!

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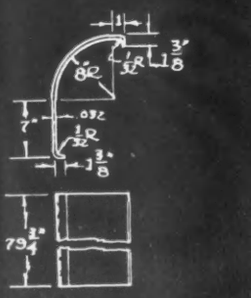
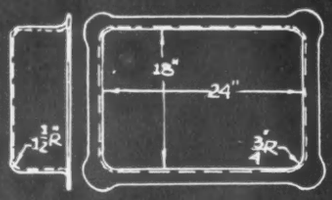
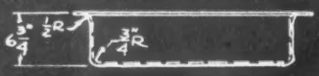




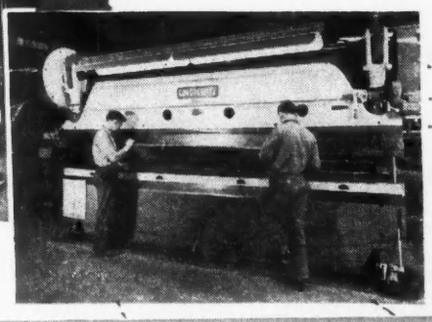


If the manufacture of your new or improved product has been interrupted by factors beyond your control, the urgency of getting it to market ahead of competition is of paramount importance. To secure immediate parts-production assistance and other benefits of sub-contracting service you will be interested in the comprehensive scope of COLGATE'S "Engineered Service."

This unique and unexcelled service offers immediate design, engineering, and production conferences that help develop your new product ideas or improve old products by substituting Aluminum, Magnesium, or Stainless Steel for other materials. Our cooperative collaboration of minds will save you time and money *before* designs have been started, also after blueprints have been prepared. COLGATE'S sales-minded designers and engineers will apply to your product these sales-building features of Aluminum, Magnesium, Stainless Steel—*lighter weight, added beauty, increased strength and durability, improved product performance, reduced shipping weight.*

COLGATE'S complete and varied tooling and production facilities can be your "branch factory" — providing ample space, supplying specialized skills and know-how, planning shortcuts for fast, economical fabrication and assembling of parts to precision tolerances, and in addition offer modern straight-line techniques that replace slower and costlier methods. And, COLGATE can be depended upon to meet delivery dates.

As the first step towards producing your product better and economically, and getting it to market faster call on COLGATE *now!* Learn how "Engineered Service" helps solve your production problems and gives your product the sales creating features of the light metals. For immediate action wire or write, no obligation, complete confidence assured.



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COLGATE *Aircraft Corporation*

AMITYVILLE, LONG ISLAND . . . NEW YORK

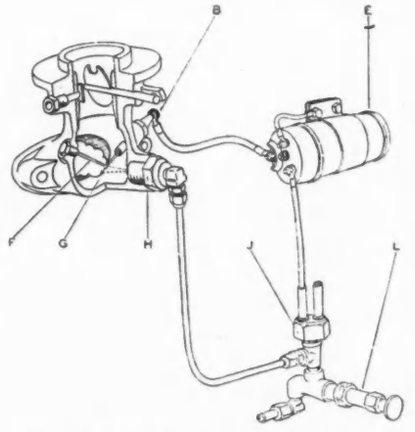
LIGHT METALS PRODUCTS

New Aid for Diesel Engine Cold Starting

When the operating temperature is below 50 F, Hercules Motors Corp. recommends that its Diesel engines be equipped with a newly-developed fuel oil burning air intake heater instead of the glow plugs formerly used. This new device is said to facilitate starting and eliminates excessive use of the starting motor and the consequent drain on the batteries. The heater assembly contains a nozzle and two electrodes and is mounted on the air intake elbow which is attached to the cylinder head. There also is a manually operated fuel oil pump, with a pressure switch and vibrator coil, mounted on the dash or instrument panel. This unit should not require attention by the operator except an occasional cleaning of the fuel nozzle and checking the electrode gap, which has a clearance of 3/32 in. If the electrodes become grounded, in very humid climates due to a condensation of moisture, it is necessary to dry the electrodes.

The functioning of the unit consists of two phases: on starting, and after the engine starts. On starting, the hand fuel pump is operated at the same time the starting button is depressed. The hand pump draws fuel from the tank and conducts it to the heater nozzle through a small tube. The small orifice in the nozzle causes a restriction in the fuel line, developing pressure which operates the pressure switch. This, in turn, closes the electrical circuit and permits current to flow to the vibrator coil, thus producing the spark for igniting the fuel spray.

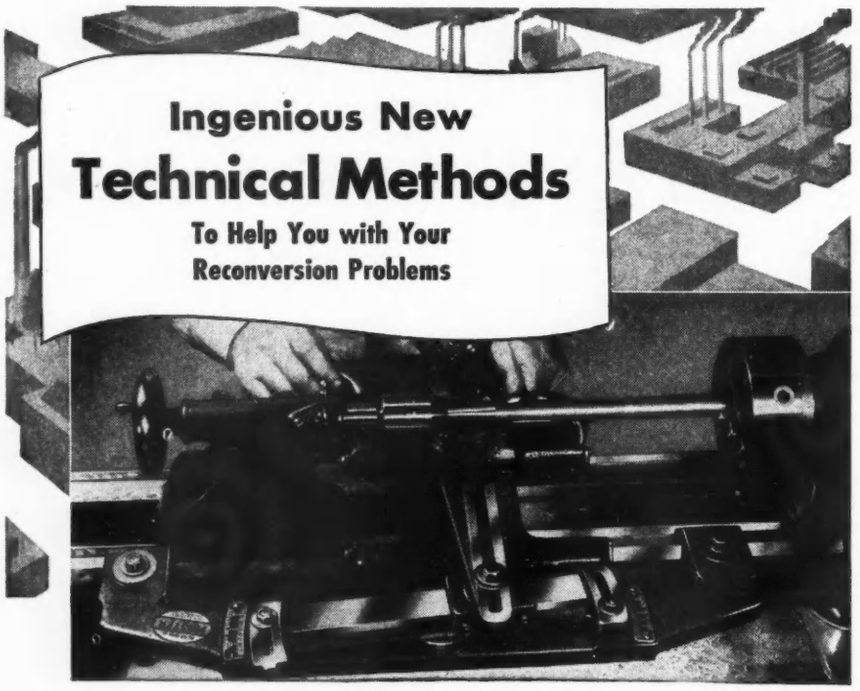
When the engine starts, the operation of the fuel oil pump and starter button is discontinued. The pressure in the fuel line then drops and the pressure switch breaks contact. Normally during this period not all of the oxygen in the air is consumed, hence the fuel previously injected into the cylinder will ignite. If the engine still does not start, operating the hand fuel pump is discontinued and the heat absorbed by the manifold is allowed to warm the air passing to the cylinder. The above condition is similar to over-choking a gasoline engine. Should the firing of the cylinders slow down while pumping, pumping is discontinued. If the engine slows down after pumping is stopped, the pump is given another short stroke. The priming pump is operated only when the engine is being cranked.



Sketch showing details of Hercules fuel oil burning intake air heater. The electrodes are marked "B" and "F", nozzle "H", pressure switch "J", coil "E", hand pump "L", electrode gap "G".

Advertising Note

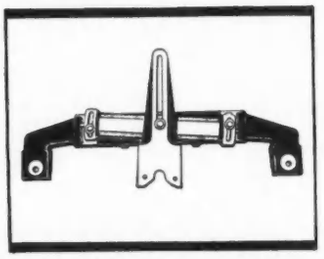
John W. Thompson, former director of public relations for the Ford Motor Co., announced the formation of John Thompson Inc., to function in the field of public relations, publicity and related services. Headquarters of the organization will be in Detroit.



Simplified Master Taper Attachment Fits All Types of Lathes Instantly!

Now! A "universal" taper attachment that fits all lathes, old or new, big or small—that can be attached or removed in *minutes!* This taper attachment is not bulky or cumbersome. It bolts easily to the bed, in the back of any lathe.

The Master performs accurate taper turning, boring and threading with the ease of any straight line tool operation. It precisely duplicates any tapered part. Is usable in any position. Does not interfere with straight turning. The bar is precisely machined and fitted. There is no vibration. Taper graduations are in inches at one end; degrees at the other. The Master is available now, in two sizes; two feet and four feet in length.



Model 710 Master Taper Attachment

Available today also, is delicious Wrigley's Spearmint Gum. This is one treat you can enjoy even when your hands are busy. And the pleasant chewing helps to keep you alert and wide-awake, even through a monotonous job.

Chewing Wrigley's Spearmint satisfies a fellow. In addition, it helps keep your mouth moist and fresh—so you feel better. And feeling better, you naturally work better. By making gum available to all, scores of plants and factories report increased morale and efficiency that really pays off.

You can get complete information from the Keene Electrical Machinery Co., 549 W. Washington Blvd., Chicago 6, Ill.

AA-63

An Analysis of The New Contract

(*Continued from page* 18)

transfers, but that it must not necessarily do so under the contract. The previous provision for grievance procedure on claims of personal prejudice or of discrimination for union activity in regard to transfers is retained. It is noteworthy too that the company may fill "secondary" openings by transfer without regard to seniority.

Another new feature of the contract is that the union shall not make demands for any new general wage increase or other economic issues before May 31, 1947. However, either party may request negotiations on wage issues after one year from date of ratification of the present contract. Formerly, the union could reopen the wage question at any time. If there is a general wage increase in the automotive industry, GM may put a corresponding increase into effect, if acceptable to the union, on the date the new pattern is established, but not before one year after the ratification date. With the exception of wages or economic demands, the contract runs for two years from date of ratification.

It is the first two-year contract in the automobile industry. However, since the wage question can be reopened after one year, it still is a one-year contract in effect, since if a strike were called over wages, the corporation could cancel the agreement, as it did the previous one.

There are no stipulations for "company security" as such in the new contract. Ford, Chrysler, and Kaiser-Frazer have included such provisions in their agreements in one way or another, all of them aimed at wildcat strikes. However, Harry W. Anderson, GM vice president, said recently that GM has always considered its contracts good enough in that respect, and has had quite satisfactory results.

The Position of General Motors

(*Continued from page* 19)

where it is already in effect, so that we shall be able to continue without a constant quarrel over production.

What we proposed on the floater period in consideration of the wage increase of 18½ cents per hour was that the Union agree that there will be no demands made for any general wage increase or increases in any of the existing rates established by job classifications, in the bargaining units, for the term of the agreement. In other words, the wage question would be frozen for a period of one year, but

(*Turn to next page, please*)

CUT LABOR COSTS
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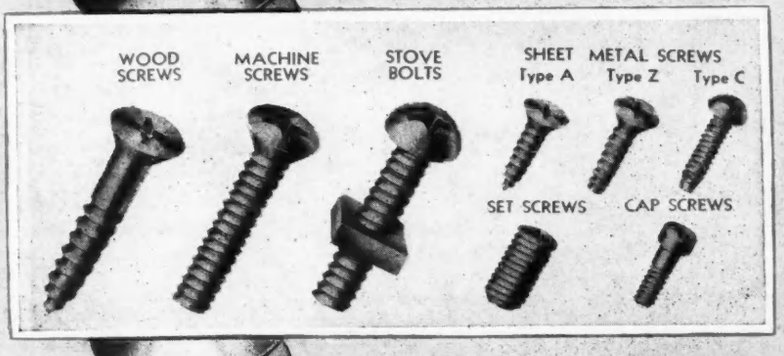
Save up to 50% in fastening time with...
HOLTITE PHILLIPS
SCREWS & BOLTS

Cut screw driving man hours in half! Use power drivers safely, even on finished parts. Engineered recess in head of these modern screws fully engages the mated tapered bit which does not slip, slide or jump out to gouge work or injure operator. Change from slow, costly, hazardous hand driving to the modern, economical method of fastening.



Now is the time to reduce every possible labor cost — to effect every possible economy in the manufacture of your product. Carefully analyze your assembling and fastening operations. You'll find a saving of 50% and over if HOLTITE-Phillips Recessed Head Screws and Bolts are driven by power. Specify them on your next order.

CONTINENTAL SCREW CO. New Bedford Mass., U.S.A.

the contract might run for a longer period of time.

We proposed that if general wage increases are being directly or generally negotiated in the automobile industry, or in the heavy goods industry, on or after March 15, 1947 the Union would have a right to re-open the issue of a general wage increase as of that date.

In other words, if we were going to have a lot of inflation in the country—and that has been one of the big points that we have been driving against all the way through, right from the very time the demands were made on us—we were not going to be a party to leading off on it. But apparently it is under way now and if after March 15, 1946, this inflationary period has gone way out, the Union could open up the question of general wage increases.

If the contract were to run until the 15th of June or the 1st of July, we would have a period between March 15 and July 1 in which to negotiate. In the event that we had an offer of a general wage increase, even though the Union did not accept it, we would be permitted to put it into effect. If we had ever had that provision in our present contract, when we offered the 13½ cents, I don't think there would have been a strike.

WE HAVE ALL THE ANSWERS!

. . . For over fifty years, G. S. Blakeslee & Co. have been engineers of cleaning equipment. A great many problems have been solved and many bottle-necks in the production line have been eliminated with Blakeslee Metal Parts Washers and Solvent Degreasers.

Numerous cleaning problems are encountered daily which are being solved by G. S. Blakeslee & Co. Let us give you the benefits of our broad experience in solving *your* cleaning problems.

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STANDARD AND SPECIALS Engineered for you

G. S. BLAKESLEE & CO., CHICAGO 50, ILLINOIS
NEW YORK, N. Y. TORONTO, ONT.

Two Ends of A Pipeline

(*Continued from page* 19)

March 13—General Motors and UAW-CIO officials agree on terms of their contract to end the strike

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March 15—On that date four and a half months after the Commerce Department report was released, Henry Wallace reverses himself and disavows the report, stating that "The projections in the release of November 1 were not intended, nor should they have been regarded, as official forecasts of costs, prices or profits for the automobile industry or for industry as a whole. The study was intended as a projection based on specific and VARYING ASSUMPTIONS. . . . The development of analytical techniques and methods should be perfected and it would be highly desirable for economists and statisticians in business, in universities, and in government to cooperate toward the improvement of these techniques."

Wallace also admitted on March 15 that the November 1 report was based on a questionable statistical study by Harold Wein, an employe of the Department of Justice since May 24, 1945. Previously he had been with the War Production Board and the Office of Price Administration.

March 18—On the floor of the U. S. Senate in Washington, Senator Homer Ferguson (Michigan) commented at length on the November 1 report, saying in part:

"This report or release in no way purported to come from anyone else but the Department of Commerce. The facts now prove to be that sometime in September of 1945 Harold Wein, an employe of the Department of Justice, had prepared an article and submitted it to *A Survey of Current Business*, a magazine or publication issued by the Department of Commerce. This

(*Turn to page* 70, *please*)

DIAMOND G HOSE CLAMPS

Assure Maximum Clamping-power!

Wherever tight joints are needed on hose lines—leak-proof connections in automotive, pneumatic, hydraulic, electric, electronic, marine and railway applications—Diamond G's are the Hose Clamps you want! Scientifically constructed and low in cost, they are the ideal economy clamp for every industrial purpose, as well as for garden hose, spraying equipment and household use.

Rust-proofed throughout — quickly and easily adjusted for all types and sizes of rubber hose and tubing—Diamond G Clamps assure trouble-free, tight connections for the delivery of air, water, gasoline, oil and chemicals. "Captive" nut—guarded by sturdy flanges—cannot work itself loose. Heavy-duty reinforced shoulders plus powerful spring action provide uniform pressure and grip around entire circumference. No leaks —no losses—no replacements!

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article was intended to be published by him in this publication under his own name and not to be given an official status as a Department of Commerce publication. He received later a request from the Department of Commerce for permission to use a part of the material. The entire article has never been published nor was the authorship of this publication made public until the 14th day of March 1946.

"In other words, Mr. President, the Secretary of Commerce took this privately prepared report, made it an official document of the Department of Commerce, and issued a statement about it. By doing that he misled the general public and the working people in Michigan. He did not, however, mislead the automobile industry, because those engaged in it knew it was not an accurate report.

"Mr. President, I have no objection to the Secretary of Commerce making any political statement he wishes to make. Today we have had almost a Henry Wallace Day in the Senate. A number of speeches have been made about him. As I have said, I am not concerned with his political utterances, but I am greatly concerned when he undertakes to place in official reports statements which are not accurate. When Harold Wein sends in an article for publication in a magazine under his own name, and the article is used as an official publication of the Department of Commerce, and is represented as official data of the Department of Commerce, then I say—and these are harsh words, but they are true—it's a fraud upon the American people, and it remained a fraud upon the American people for 4½ months."

In its report President Truman's General Motors Fact Finding Board credits Harry Magdoff, chief of the Current Business Analysis Unit in the Bureau of Foreign and Domestic Commerce, Department of Commerce, with having contributed "technical assistance and advice." That unit prepared the two alleged Commerce Dept. studies for publication.

Another Government economist, whom the General Motors Fact Finding Board credits with having given "technical assistance and advice," was Jacob L. Mosak, chief of the Economic Analysis and Forecasting Branch, Research Division, Office of Price Administration. The OPA, as is well known, gathers so-called confidential cost information from the automobile companies for use in fixing ceiling prices of automobiles.

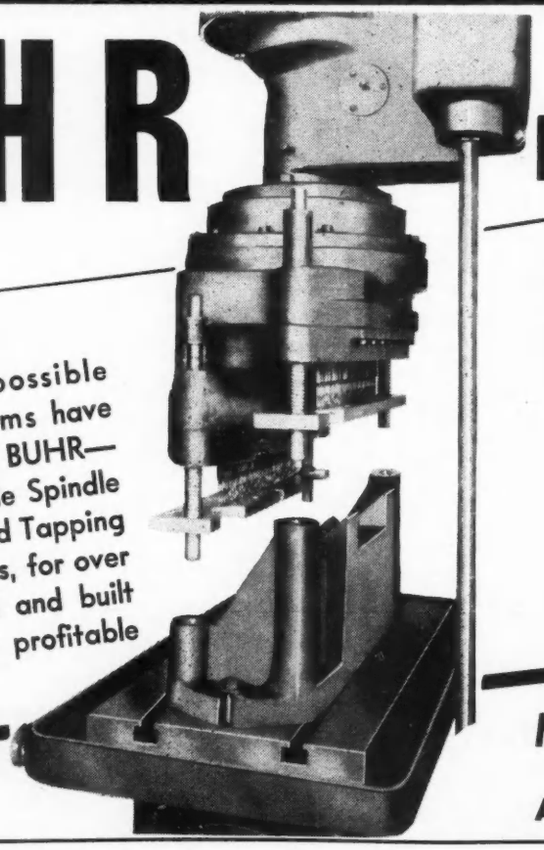
Also assisting the General Motors Fact Finding Board was a staff of War Labor Board employes under the direction of Milton Derber, director of the Program Appraisal and Research Division. Other members assisting included Miss Minnie Dockterman, Mrs. Mary Kaufman, Moses Luckaczer, Sidney Netreba, Miss Annette Greenberg, Mrs. Mary Hilton, David Farber, and Woodrow Ginsburg.

Contained in the UAW October brief, "Purchasing Power for Pros-

(*Turn to page 74, please*)

MEETING COMPETITIVE PRODUCTION!

BUHR FOR PROFITS!



Buhr Tooling . . .

Many seemingly impossible production problems have been easily solved by BUHR—Specialists in Multiple Spindle Drilling, Reaming and Tapping equipment. Buhr has, for over 25 years, designed and built this equipment for profitable mass production.

Typical tooling by Buhr is this Multiple Spindle Drill Head for Stove Burners . . . 72-Spindle Oscillating Drill Head—Bushing Plate . . . Fixture for Drilling 72 holes .104 diameter in a rectangular cast iron gas stove oven burner.

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TODAY, literally thousands of parts, that formerly had to be forged, machined or cast, can be successfully stamped—at lower cost—from cold rolled steel strip.

Into the last four years we have crowded ten years of peacetime progress. In solving some of the war's toughest manufacturing problems we have discovered ways to use steel strip where it has never been used before. We have helped to develop manufacturing processes that now make it possible to meet with *stamped parts*, tolerance limits usually required for machined parts. And we have learned how to produce strip, in Carbon, Alloy and Stainless Steels, so unfailingly uniform in analysis, gage, size, finish and temper that your high speed production lines, once set up, can be kept flowing without interruption.

This specialized "know how" and the unexcelled facilities of the country's largest manufacturer of cold rolled strip are available to every user of U·S·S AMERSTRIP—not only to improve your peacetime products but to speed up their manufacture and to lower their cost.

Nothing would please us more than to offer immediate delivery of U·S·S AMERSTRIP, but circumstances beyond our control together with a tremendous backlog of orders make this kind of service impossible at present. You can be sure however that we will do everything within our power to take care of your requirements just as soon as conditions permit.

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perity," as Appendix Two on pages 69-73, were statistics and conclusions arrived at in "Facts Relating to Wage-Price Policy," a report by Government economists to the Office of War Mobilization and Reconversion, which was not released until the last week in October, after the UAW report was printed.

XB-44 Super Bomber Announced by ATSC

The existence of a Boeing "Superfortress," the XB-44—a counterpart to the B-29 — with increased power and improved flight performance, has been announced by the Air Technical Service Command, Wright Field, Dayton, Ohio.

This experimental model of the famous B-29 has been tested in flight since June 1945 under the supervision of ATSC and Pratt and Whitney Aircraft Division of the United Aircraft Corp. at East Hartford, Conn. The production version, now being built by Boeing Aircraft at Seattle will be known as the B-50, "Superfortress."

Powered by four R-4360 Pratt and Whitney radial engines, the XB-44 has a total of 12,000 hp. The increase in horsepower, over the B-29, comes from a change in the engine installation. The large increase in the available power provides a marked improvement in the takeoff, rate of climb, and speed of the aircraft. Jet exhaust stacks give the airplane an increase in speed beyond that accounted for by the greater rated power of the engines. The airplane can be sustained in flight on less power than is available from one engine.

New nacelles have been designed for the XB-44 which enable a very rapid change of engines. The new nacelle, also referred to as a power unit, contains the engine, supercharger, induction system, oil system and engine and propeller controls. This new power unit can be quickly detached from the firewall permitting interchangeability. Any one of the four engines, or power units, can be replaced with a new one in a very short length of time. It formerly took six men, eight hours to change one engine on the B-29 and now, with the power unit, it is said that the same number of men can do the same job in one-half hour.

The propellers have been replaced by a four-bladed Curtiss Electric propeller which has the reversible pitch feature, for braking purposes, and also a feature that permits the automatic synchronization of all four of the propellers. Although some more recent models of bomber aircraft have had this installation, the XB-44 is, experimentally, using this feature for tests to improve it. The main reason for synchronization of the propellers is the greater reduction in noise and the lessening of vibration while the aircraft is in flight.

FOR many, many years, Spicer Axles and Propeller Shafts have been standard equipment in Studebaker automobiles. The splendid service record of these Spicer products dictated their use in the dashing new Studebakers now appearing on America's highways. Each new Studebaker gives added prestige to Spicer engineering and manufacturing skill . . . for 42 years the standard of excellence in the automotive power transmission field.

Spicer Manufacturing Corporation, Toledo 1, Ohio

The new Studebaker is equipped with Spicer Axles and Propeller Shafts.

42 YEARS OF
Spicer
SERVICE

Transmissions, Torque Converters, Clutches, Passenger Car Axles, Universal Joints, Parish Frames, Stampings. Spicer "Brown-Lipe" Gear Boxes

Reports on German Military Vehicles

(*Continued from page* 29)

similar size under identical air flow and water flow conditions, tests showed the 132 per cent heavier German zinc radiator to have 15 per cent less heat transfer capacity. German designers relied on excess weight to provide integral strength in their radiators rather than giving attention to the mounting to keep weight at a minimum.

The Germans attached considerable importance to oil coolers, which were installed on both aircraft and ground vehicles, including the Volkswagen engines. The cooling system on the Panther tank consisted of four radiators, three being used for engine jacket coolant and the other divided into two sections, one for cooling of transmission oil and the other for engine jacket coolant. The Tiger Model H tank engine was equipped with an oil cooler enclosed by a jacket through which hot water could be circulated from an outside source in cold weather to warm the cold lubricant. When the oil was cold, a spring loaded valve also permitted bypassing the cooler.

For the assembly of aircraft aluminum radiators, industry-wide use was made of the atomic hydrogen arc welding process.

A detailed account of the development and design of German transmission systems was given in papers by R. R. Burkhalter, of the Spicer Manufacturing Corp., and by Lt. Col. Ewen McEwen, R.E.M.E., assistant director of the Fighting Vehicle Design Dept., British Ministry of Supply.

Trucks and semi-track vehicles had conventional gear boxes, but on the full-tracked vehicles special mechanisms were provided to improve handling and maneuverability. In some cases the system was complex, such as the Maybach Variorex preselective tank transmission, which had ten forward speeds, the lowest four of which were also available in reverse at twice the reduction ratio. It was pointed out that in service, due to the ten ratios being so closely spaced, there was a widespread tendency among drivers to skip the intermediate ratios and use it as a five-speed gear box.

Automatic hydraulic torque converters began to appear in the latest tank models. One installation was a three-stage torque converter in combination with a two ratio gear box.

A single-stage torque converter, a sectional view of which is shown elsewhere in this article, was used in a radio-controlled vehicle. It operates as a torque converter with the reaction member stationary until the impeller and turbine torque are equal. The reaction member then is locked to the turbine and the unit operates as a fluid coupling. Construction of the automatic reaction member control also is illustrated. The reaction member clutch gear is mounted on a helical spline and as the change from positive to negative reaction takes place the clutch gear is shifted from engagement with the stationary case to engagement with the turbine.

Another illustration in this article shows a single-stage torque converter and fluid coupling in tandem, which is a more efficient design since it is not necessary to sacrifice desirable converter characteristics to obtain a suitable fluid coupling, Mr. Burkhalter explained. When the reaction member shifts into engagement with the turbine and the forward unit operates as a fluid coupling, the rear fluid coupling is filled automatically.

In general the design of friction clutches was conventional, single-plate type being installed with engines up to 100 hp and two-plate clutches with larger engines. Of interest is the novel method of retaining the bearing races in the yokes of universal joints. Instead of accurate machining as is done in regular practice to maintain concentricity, annular grooves are machined in the bearing race and yoke, and at assembly with the parts held in

(*Turn to page* 78, *please*)

THERE'S a race on—for markets, against finely trained fast-stepping competition. Are you ready?

Many alert manufacturers have talked over their problems—with Aetna; have found practical ways to improve both their products and their equipment by use of more bearings, or better suited bearings; are already in the pink of condition for a gruelling contest.

Aetna can help you plan right now; and faced by no reconversion problem, we can start making bearings for you as soon as our war production obligations, rapidly diminishing, have been finally discharged.

Better call Aetna. Aetna Ball and Roller Bearing Company, 4600 Schubert Avenue, Chicago 39, Illinois.

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Portable Bryant Thread Gages

Bryant Thread Gages have proved their superiority for bench work . . . now, the new *Portable* gage offers fast, accurate inspection of internal threads in large castings, work in the machine, etc., or in any parts where bench inspection may be inconvenient.

The Bryant Portable Thread Gage is so accurate that it can be used to check master gages, and on production work it will check threads *all* over in a few seconds. It is 4 to 5 times faster than plug gaging. Retracting gage segments *eliminate* threading the gage into and out of threaded holes — they prevent wear — on Class 4 and 5 fits, selective assembly is possible by classing threads according to indicator readings — pilots on back of thread segments mean rapid, catchless insertion and removal of the gage — there is no chance of cross threading.

The fastest, cheapest, most accurate method of inspecting threads is the Bryant method — it is the *only* method for *visually* indicating the size of internal threads. Write for complete details.

Perfect for inspecting threads on large pieces that cannot be moved conveniently to the inspection department.

Allows checking of threads in the work in the machine.

Eliminates threading of gage into and out of threaded holes.

Four or five times faster than plug gaging.

Gives overall inspection in a few seconds—at a glance.

Master gage accuracy transferred quickly to production parts.

BRYANT

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a concentric position, a thermo setting plastic is forced into the annular space. To shear this plastic retainer ring, it is claimed a load of 3000 lb is necessary in a medium sized joint. In service a hand gun was used to replace the plastic.

Colonel McEwen devoted his paper to descriptions of the construction and operation of the gear boxes on the various German tank models. The designs, he said, show complexity, lavish expenditure of man-hours, first rate workmanship, and extremely ingenious detail design, but an apparent inability to use simple means to an end. One example is the Maybach Variorex 10-speed unit mentioned previously and another the Maybach Olvar, similar in principle to the Variorex, but having eight forward speeds and four reverse ratios, and utilizing an all-hydraulic control mechanism instead of a vacuum-hydraulic control as on the Variorex. The Olvar gear box was installed in the Tiger Mark VI tank. At the end of the war the ZF (Zahnradfabrik Friedrichschafen) firm was developing a unit with electro-magnetic clutches for changing gears in conjunction with single helical gears and an orthodox layout. Maybach had under development the Mechydro, a combined torque converter and four-ratio fully automatic gear box. All gear ratios were available in reverse, there being a single-stage unit to transmit torque in the forward direction and another for reverse direction. Voith's new Arta hydraulic transmission had two selectively filled torque converters.

Details on the suspension, steering and track systems of German military vehicles were reported by Tore Franzen and R. L. Weider, Chrysler Corp. and White Motor Co. engineers, respectively. Torsion bar suspension was adopted for tanks in 1938 when the Mark III tank was built in Berlin by Daimler-Benz and was used on subsequent tank models and also on a number of other vehicles, including the Volkswagen and ¾ track tractors.

Of the various German transport vehicles, the ¾ track tractors are of special interest. Although used at times to transport troops, they were designed primarily to pull loads and performed well for machines of their size, even on boggy ground where their performance is said to have been up to full track standards. They were made in six sizes, the smallest of them having a weight (loaded) of 10,800 lb and a rated towing capacity of 2200 lb. Powered by a 90-hp engine, its maximum speed was 40 mph. The largest tractor weighed 39,600 lb (loaded) and had a towing capacity of 39,600 lb. Its top speed was 25 mph with a 230-hp engine. The payloads of these vehicles were very small.

Much of the superior performance of these tractors is attributed to the exceptionally well designed tracks, the links of which had needle bearings that were particularly successful. According to captured crews they were never lubricated in the field, the factory lubricant being considered adequate. A sectional view of a link is given with this article. British authorities state that the full life of the tracks extended beyond the standard tests. The tracks carried 84 to 87 per cent of the loaded vehicle weight.

In his paper Weider described several unconventional suspension and steering systems found on German vehicles. Of unusual design was the suspension used on the eight-wheeled armored car, which also was equipped with a complicated steering arrangement with linkage to each wheel and a steering wheel at each end of the chasis to make it possible to steer the car in either direction at a substantial speed.

Each wheel is linked to the frame by two swinging arms as shown in the accompanying illustration. At their outer ends the arms have spherical bearings that connect them to the stub axle. Attached to the upper arm is a leaf-type spring mounted parallel to the frame side rail and pivoted at the other end to an extension of a cross tube of the frame. So that there will be only a small variation in the inclination of the wheels during their

(*Turn to page 82, please*)

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ATTRACTIVELY streamlined and built for utmost comfort and convenience, this unit is an example of the service rendered by the FITZJOHN FALCON Intercity Coach. TUTHILL Leaf Springs add to its easy-riding qualities. Made of alloy steel, uniformly tempered and tested, TUTHILL Springs are noted for their resilience and shock-absorbing ability. For *Quality* choose TUTHILL.

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EASY FABRICATION

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AUTOMOTIVE & AVIATION steering wheels, instrument panels, radio grills, controls, switch buttons, door handles, radiator ornaments, bezels, lighting fixtures, antennae housings, ventilator tubes, transmitter guards, interior trim, cockpit enclosures.

RADIO & ELECTRICAL molded parts and fittings, panels, bezels, instrument housings, insulation, plugs, jacks, molded trim, knobs, dials, coils, lighting fixture parts, switch plates, instrument housings, fuse plug windows, toggle switches, condensers.

HARDWARE tool handles, mallet heads, motor tool housings, drawing instruments, transparent oil cans, architectural moldings, hinges, door knobs, threshold strips, transparent safety shields, transparent eye protectors, industrial chart covers, piano keys, lunch boxes, plastic glazing.

APPLIANCES telephone handsets, shaver housings, parts for refrigerators, washers, dryers, mixers, vibrators, sunlamps.

HOUSEHOLD ACCESSORIES coat hangers, closet hooks, blanket boxes, shower curtain rings, toilet seat veneering, bath wall fixtures, towel racks, mailboxes, drawer pulls, closet accessories, lamp shades, clothespins, bookends, table mats, table decorations.

COSMETICS compacts, lipstick cases, powder boxes, puff boxes, tissue holders.

PERSONAL ITEMS pencil cases, pencils and pens, beads, tooth brush handles, eyeglass frames, combs, handkerchief boxes, picture frames, shoes, slippers, toilet sets, jewel boxes, buttons, belt buckles, costume jewelry, millinery trimming, handbags, hatboxes, transparent bibs, artificial flowers.

SPORTING GOODS fishing tackle boxes, tennis rackets, gun stocks, fish net floats, artificial lures, camera housings, photographic equipment, films, sun glasses.

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PACKAGING film wraps, window cartons, set-up boxes, all transparent bags and envelopes, transparent rigid containers, molded containers, decorative and protective laminations, reuse containers.

rise and fall, pivots have been located accordingly on the lower and upper arms, the former being longer than the latter. Plaited steel wire check straps limited the downward movement of the suspension unit.

Bonding of synthetic rubber to steel parts was being facilitated by brass plating the latter, which the Germans were trying to eliminate. At the I. G. Farbenindustrie laboratories an improved bonding process was being developed that used a coating of a new chemical called Desmodur R, which could be applied more efficiently than brass plating and produced a more satisfactory bond, Earl W. Glen, of the Rubber Division, Civilian Production Administration, stated in his paper, "Observations of the German Rubber Industry." Desmodur R is said to have excellent qualities as a tire cord dip and as a general adhesive. Some of it has been brought to this country for experimentation. The German version of the run-flat tire was found to be a regular truck tire with a cellular solid rubber filler replacing the conventional inner tube.

Hardman Motion Converter

(*Continued from page* 43)

of the reciprocator is in the same plane of the rotors which cause its motion, it is never possible to have absolutely constant angular velocity of the rotors; that is, it is necessary to provide inertia forces by slowing the rotors down to carry the reciprocator beyond the end of its stroke. Consequently, the motion of the reciprocator is not absolutely simple harmonic. However, flywheels on the rotor shaft may be designed to keep the rotors revolving at essentially constant angular velocity, so that the reciprocator, for all practical purposes, describes simple harmonic motion.

Due to the friction of the thrust bearing which mounts the shuttle on the reciprocator, there is a tendency for the reciprocator to rotate with the shuttle. This rotation does not transmit work, however.

The motion of the spherical bearing has three components with respect to fixed space: (1) A revolution in a circular path by virtue of its being in the rotor; (2) an oscillation in its socket due to the oscillation of the shuttle; and (3) a revolution about the axis of the shuttle arm. This latter motion, due to the difference in drag between the ball and the socket and the ball and the shuttle arm, is of an indeterminant nature.

The National Bureau of Standards states these conclusions in the report: The test units were sturdy and apparently free from inherent mechanical defects; the mechanism is inherently well balanced, so that when run free at any speed, vibration is negligible; the device provides linear harmonic motion with no side thrust, so a double-acting cylinder could thus be mounted directly on the housing of this mechanism; the friction loss in the mechanism is comparable with that of conventional converters; and the designed speed ratio between the two motions can be varied between rather wide limits.

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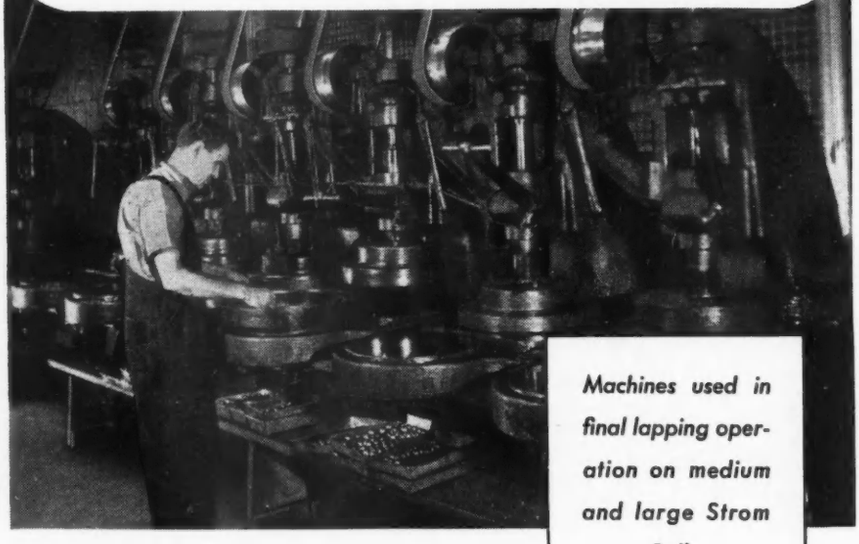

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It takes a long series of processes, developed and perfected over a period of years, to make a thing as faultless in material and form as a Strom Metal Ball. Worked to a tolerance of fifty millionths of an inch, their outstanding qualities of finish, sphericity and precision have made Strom Balls the standard of industry. Strom Steel Ball Co., 1850 South 54th Ave., Cicero 50, Illinois.

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The Eaton Manufacturing Co., Cleveland, Ohio, has acquired all outstanding shares of Dynamatic Corp., Kenosha, Wis., manufacturers of Dynamatic induction drive apparatus. Among Dynamatic's numerous applications are the highest speed and highest power dynamometers in the world. Established in 1933, Dynamatic Corp. is headed by Anthony Winther, president; Martin P. Winther, vice-president and general manager, and Mart Kindt, secretary, who, in addition to their highly specialized personnel, will remain in their present positions. Dynamatic manufacturing operations will continue in Kenosha.

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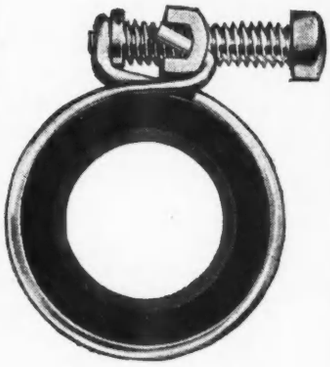

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900 S. Wabash Ave., Chicago 5, Ill.

Inspection of Castings for Airplanes

(*Continued from page* 40)

require a sampling X-ray inspection in accordance with Table II. Class II-B castings, which include such types as die and lead castings, will not be submitted for X-ray inspection.

As explained above, separate radiographic standards have been established for "critical" and "non-critical" areas of the casting. The common defects which occur in castings have been divided into three groups: (a) Absolute rejects (critical or non-critical area); (b) Discrete defects; (c) Dispersed defects. After a casting has been produced and X-rayed, any defects which appear in the radiograph are compared with the maximum acceptable defect of that type shown in the standards. If the defect occurs in a "critical" area, the standard for critical areas is used. If the defect occurs in a non-critical area, the non-critical standard is used.

In the case of discrete defects, the standards show the maximum acceptable size of the defect for any one square inch of area of the casting as it appears in the radiograph. In the case of dispersed defects, the standards for both "critical" and "non-critical" areas are shown at approximately one and two per cent sensitivity. This enables one to judge the thin sections of the casting when the thick portions are X-rayed to a minimum of two per cent sensitivity.

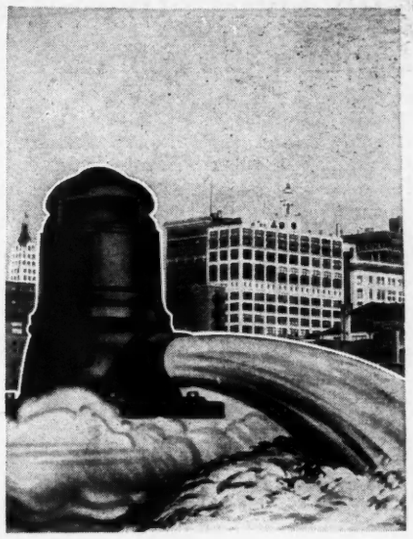
This method of inspection results in elimination of all castings which have defects which are objectionable in any degree. It keeps the critical areas of all castings up to a high degree of homogeneity and structural soundness. It keeps the non-critical areas up to a reasonable standard of quality. It keeps a constant check on the foundry and makes certain that the quality on all castings is maintained.

New Identification for Bendix-Westinghouse Units

Beginning just as soon as the transition can be accomplished, Bendix-Westinghouse air brake units, both new and factory reconditioned, will bear a specially designed tamper-proof, metal seal. Attached to each unit, these markers replace the familiar paper, tag-shaped devices formerly used to identify genuine parts of the Bendix-Westinghouse automotive air brake system.

American Tire Production To Reach 90 Million Units

John L. Collyer, president of the B. F. Goodrich Co., has estimated that American tire production would total 90 million units for 1946, and urged that synthetic rubber research be pushed to the utmost for the next two years "and the road kept open for private purchase and operation of the plants."



Thousands of Cities
HAVE LAYNE
WELL WATER SYSTEMS

Quality that gives supreme satisfaction was the ultimate deciding factor with thousands of cities that now own Layne Well Water Systems. These cities—and they range from the Nation's largest to those of only a few inhabitants—were careful to place known performance before idle claims. In buying Layne Well Water Systems they obtained the very best that skill and experience could create.

Layne Well Water Systems have long been first choice by big and little cities everywhere—first choice for highest efficiency, lowest cost operation and unparalleled long life. In a like manner, thousands of industries;—processing plants, factories, railroads, oil refineries, ice plants and irrigation projects also buy and use Layne Well Water Systems.

Each Layne Well Water System is built to fulfill a specific need—and built to produce the utmost amount of water under any and all conditions. For illustrated literature, address Layne & Bowler, Inc., General Offices, Memphis 8, Tenn.

HIGHEST EFFICIENCY

Layne Vertical Turbine pumps are available in sizes to produce from 40 to 16,000 gallons of water per minute. High efficiency saves hundreds of dollars on power cost per year.

AFFILIATED COMPANIES: Layne-Arkansas Co., Stuttgart, Ark. ★ Layne-Atlantic Co., Norfolk, Va. ★ Layne-Central Co., Memphis, Tenn. ★ Layne-Northern Co., Mishawaka, Ind. ★ Layne-Louisiana Co., Lake Charles, La. ★ Louisiana Well Co., Monroe, La. ★ Layne-New York Co., New York City ★ Layne-Northwest Co., Milwaukee, Wis. ★ Layne-Ohio Co., Columbus, Ohio ★ Layne-Texas Co., Houston, Texas ★ Layne-Western Co., Kansas City, Mo. ★ Layne-Western Co. of Minnesota, Minneapolis, Minn. ★ International Water Supply Ltd., London, Ontario, Canada ★ Layne-Hispano Americana, S. A., Mexico, D. F.

LAYNE

WELL WATER SYSTEMS
VERTICAL TURBINE PUMPS

The Automotive Situation in the Far East From a Correspondent in That Area

Batavia, 1/28/46

The situation out here as regards the automotive industry is somewhat confused at present. In Malaya, only two motorcar importers (who have amalgamated for a period of twelve months) are operating. The amalgamated company, which was fortunate to find all its buildings intact, is busy repairing old cars and trucks for the British Military Administration (Civil Affairs). In addition, they have recently "sold" about one hundred 8 hp English Ford Tudor Saloons at Straits $2,600 each (U. S. $1,230) against a prewar price of Straits $1,100 each (U. S. $520), an increase of some 236 per cent. Even so, it was not a matter of selling, but merely handing over, against cash, in accordance with priority allotted by the authorities.

The waiting list counts hundreds of applicants, and it is growing daily. Most civilian vehicles in operation at Singapore are ready for the scrap heap. Many are literally tied together with bits of string. One time luxury passenger cars now appear with the rear portion of the body cut away and a wooden delivery box installed in lieu. Very few wheels match on any one vehicle. It is a common sight to see passenger cars with different makes of front wheels and truck disk wheels, converted to suit the hubs, fitted to the rear.

A few Diesel buses, run by the Singapore Traction Co., are operating. They are so worn and their fuel pumps so out of adjustment, that one seldom sees the actual bus, but only realizes that one has passed when the black, evil smelling cloud of exhaust gas has lifted.

The following approximate registration figures show the position at Singapore at the time of writing:

	1942	1946	Drop %
Motor Cycles	500	185	63
Cars and Trucks.....	11,000	1,350	87.7
Buses	430	72	83.3
Taxis	920	750	18.5

The spare parts position is also quite desperate. Looted parts, mostly secondhand, may be had from Chinese dealers in the back streets, at ten times the prewar value. A 600-16 tire brings about $100 (U.S.). Looted wrecks, their bare rusty skeletons reaching through the tall grass, line most roads outside the town area. Thousands more rot away in many large scrap dumps in various parts of the island. Upcountry the situation is similar. In short, there is a great demand in the whole of Malaya for vehicles and parts —and no "trade-ins."

At the present time, it is difficult to say anything about Netherlands East Indies owing to the political unrest. Physically, however, there is little difference in the picture except that the population in Malaya appears to be better off financially than the people in Java, for instance.

Gas Turbines for Aviation Auxiliary Power Plants

A new kind of aviation auxiliary electric power plant is appearing on the scene, Westinghouse engineers stated recently. The prime mover is a small gas turbine. Connected to the turbine is a 24-kw, 30-volt d-c generator, and a 2.5-kva, 120-volt, 400-cycle generator. Also required is a 5-hp motor for starting the turbine, a voltage regulator for each of the generators, and a 1000-amp relay to prevent current from flowing from the battery to the d-c generator. Other accessory power plants being studied will provide 400 cycle power at 40 to 50 kva for a-c powered airplanes, and will include small d-c generators for auxiliary 28-volt d-c power.

CYLINDER LINERS

A DEPENDABLE SOURCE OF SUPPLY

For 90 years we have been supplying castings to manufacturers who wanted good value. Today, as a result of steady growth, our foundry is casting large quantities of parts in ALL ferrous metals—gray iron, Gunite, malleable, and steel. Items of particular interest to the automotive trade are shown here — Brake Drums (rough or completely machined), Cylinder Liners, and Brake Shoes (rough castings only). With experienced engineering service, efficient production methods, and careful laboratory control, we can provide a dependable source of quality castings. *Let us quote on your next order.*

MADE BY GUNITE FOUNDRIES ROCKFORD, ILLINOIS

GUNITE CASTINGS...FOR TRUCKS, TRACTORS, TRAILERS, and BUSES

For Strength with less Dead Weight

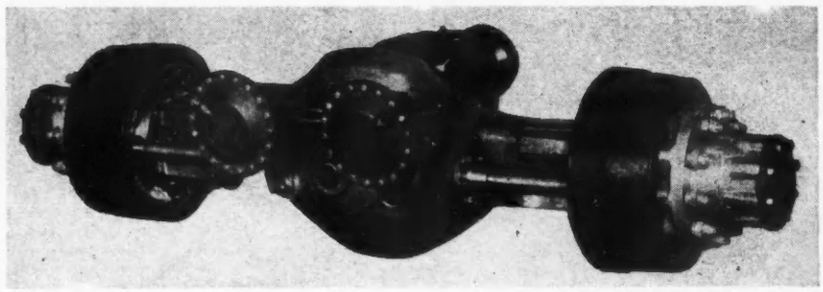
J&L OTISCOLOY

SHEETS · PLATES

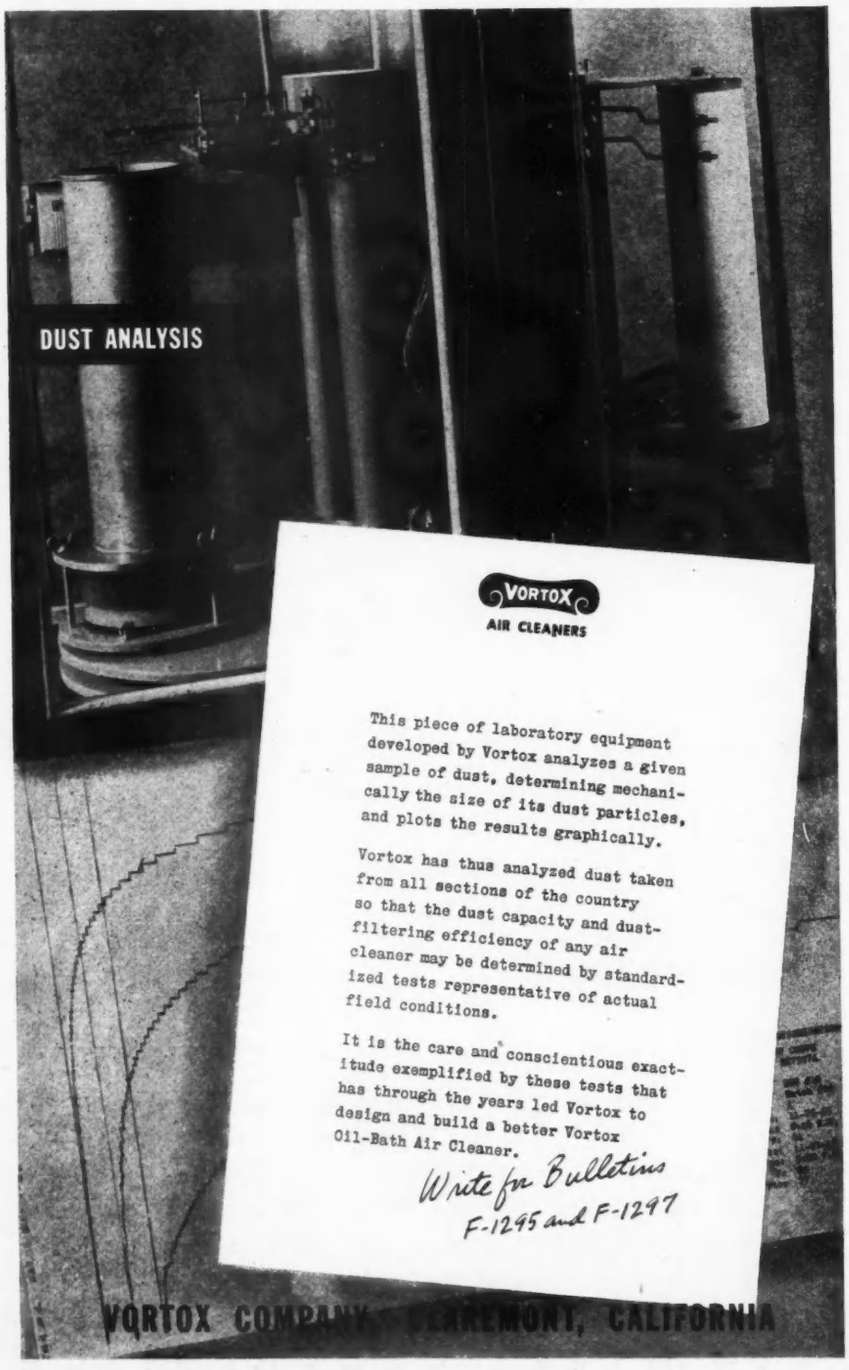
Many manufacturers are using J&L Otiscoloy sheets and plates to reduce dead weight, increase pay load in buses, trucks, and other equipment. Its high strength and formability make it particularly suitable for use in producing formed structural members to support roofs and side panels. Operators find that its resistance to abrasion and corrosion is a big advantage in reducing maintenance costs and down-time. Ask the nearest J&L District Office for further information.

JONES & LAUGHLIN STEEL CORPORATION
PITTSBURGH 30, PA.

Timken 5-200-P Rear Axle



This light-weight, heavy-duty truck axle with aluminum housing, hubs, and brake shoes has been brought out by the Timken-Detroit Axle Co., Detroit, Mich. The aluminum rear axle is designed for heavy-duty hauling in cities and states allowing over 18,000 lb at the tires on the ground per axle. The "S-200-P" axle is available with two types of final drives, hypoid-helical double-reduction and 2-speed hypoid-helical double-reduction. Each type of final drive is interchangeable in the same axle housing using the same axle shaft. With aluminum construction, the "S-200-P" weighs 220 lb less than the same unit equipped with malleable iron parts.


DUST ANALYSIS
VORTOX
AIR CLEANERS
This piece of laboratory equipment developed by Vortox analyzes a given sample of dust, determining mechanically the size of its dust particles, and plots the results graphically.
Vortox has thus analyzed dust taken from all sections of the country so that the dust capacity and dust-filtering efficiency of any air cleaner may be determined by standardized tests representative of actual field conditions.
It is the care and conscientious exactitude exemplified by these tests that has through the years led Vortox to design and build a better Vortox Oil-Bath Air Cleaner.
Write for Bulletins F-1295 and F-1297
VORTOX COMPANY - CLAREMONT, CALIFORNIA

PERSONALS

(*Continued from page* 52)

ton E. Stryker, elected President and General Manager.

Jessop Steel Co., **Wayne R. Spahr,** appointed Advertising Manager.

Purolator Products, Inc., **Melville D. Johnson,** appointed Works Manager.

The Udylite Corp., **Vincent R. Kelly,** Sales Engineer for Indiana territory.

The National Radiator Co., Plastic Metals Div., **Charles E. Hanson,** Eastern Seaboard representative for Plastic Metals, with New York as headquarters.

Wickwire Spencer Steel, **G. Gordon Lloyd,** General Supt. of Buffalo plant.

The B. F. Goodrich Co., **Thomas J. Cain, Jr.,** appointed Director of Safety for all Akron plants of the company. **Leonard M. Freeman,** made Manager of newly established works laboratories. **Joseph C. Herbert,** Factory Manager for Tuscaloosa Tire Plant. Chemical Div., **W. W. Scull,** Production Manager of Plants.

Ransome Machinery Co., **R. J. Patton, Jr.,** Regional Mgr. of Industrial Div.

Despatch Oven Co., **A. E. Grapp,** elected Chairman of the Board of Directors; **H. L. Grapp,** elected President and General Manager.

Aireon Mfg. Corp., **Daniel Wolfred,** appointed Works Manager; **Arthur E. DesNoyers,** named Director of Procurement.

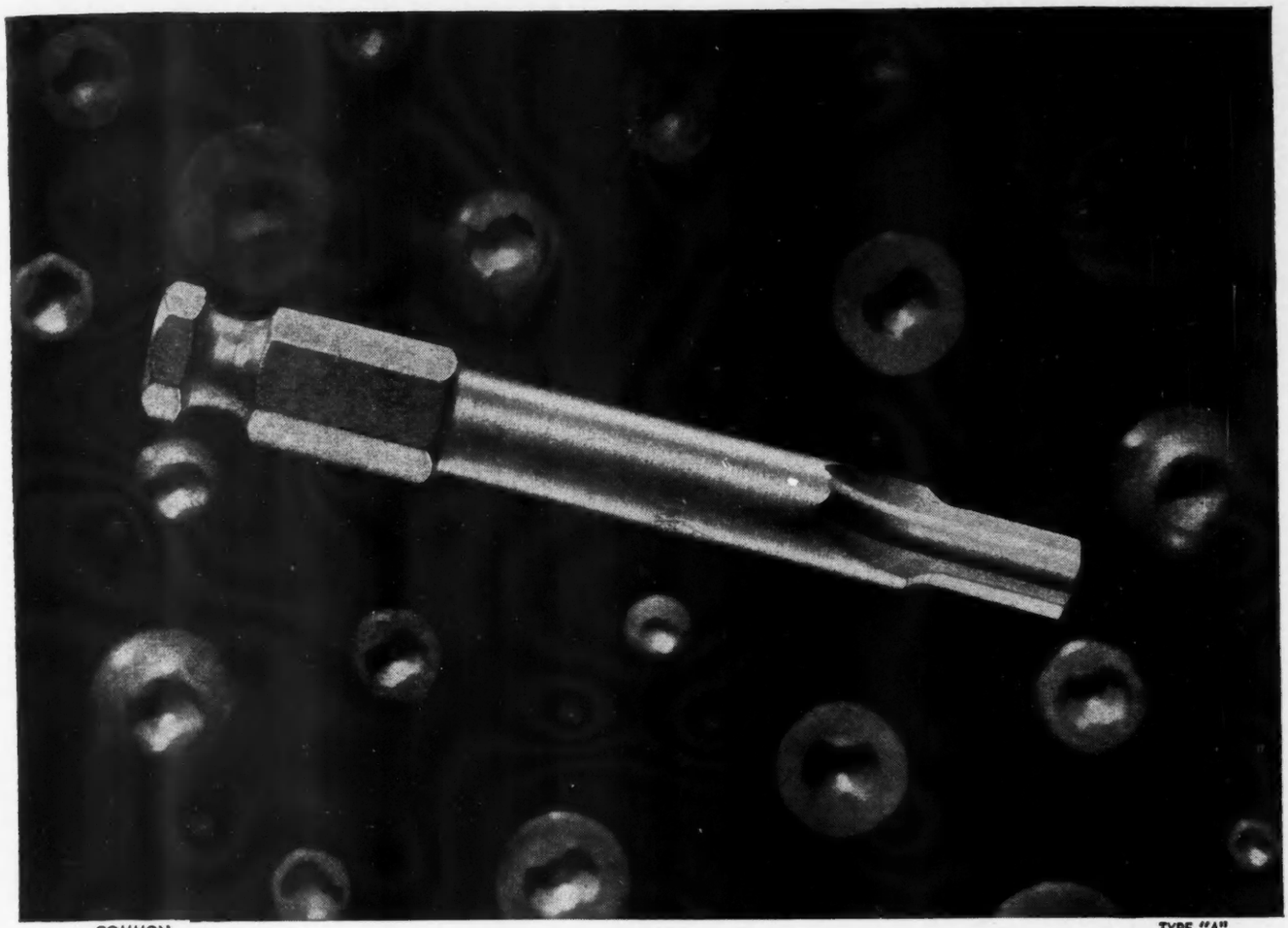
Climax Molybdenum Co., **Lars E. Ekholm,** has joined metallurgical engineering staff.

Caterpillar Tractor Co., **Kenneth F. Park,** named engineering consultant.

The Weatherhead Co., Liquefied Petroleum Gas Div., **Richard H. Wherry,** Chief Engineer.

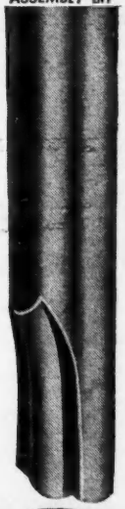
Eaton Mfg. Co., Foundry Div., **Howard H. Wilder,** appointed Chief Metallurgist.

Sherwin-Williams Co., **Clarence B. Bull,** appointed General Manager of Transportation Sales.



COMMON SCREWDRIVER

TYPE "A" ASSEMBLY BIT



How Many Thousands of Screws Per Bit?

CLUTCH HEAD users have the answer to this question . . . for that is how they measure the economy and efficiency of screw driving on their assembly lines.

The explanation of this unequalled "high-score" driving is simple. It lies in the ruggedness and design of the Type "A" Bit. This ruggedness is self-evident and is made possible ONLY by the mating design of the Clutch recess. This means stamina to stand up through a longer driving spell, free from tool change interruptions . . . speeding up the production tempo and rolling up the record of thousand upon thousand of extra screws per bit.

Note, too, that the driving score of this bit is multiplied time and time again because it may be repeatedly restored to original efficiency by a 60-second application of the end surface to a grinding wheel.

Other special features incorporated in CLUTCH HEAD *Screws contribute importantly to greater safety, higher production, and lower costs. We invite your personal investigation of these and will send you,* BY MAIL, *package assortment of* CLUTCH HEAD *Screws, sample Type "A" Bit, and illustrated Brochure.*

Being operative with an ordinary screwdriver or any flat blade of reasonably accurate width, this is THE ONLY MODERN SCREW *that simplifies your field service problems.*

CLUTCH HEAD · SCREWS ·

Note the straight-walled Clutch matched by straight-sided driver for square engagement, eliminating "ride-out" tendency with hazard of slippage as set up by tapered driving.

UNITED SCREW AND BOLT CORPORATION

CLEVELAND 2 CHICAGO 8 NEW YORK 7

Production Resumed

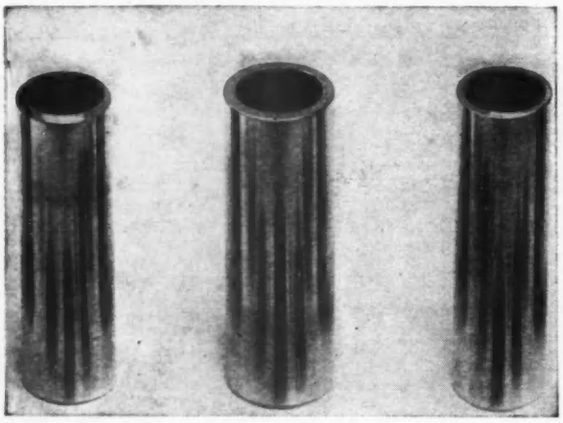
(*Continued from page 47*)

is somewhat unsettled, but with price ceilings removed from original equipment for trucks some progress is being made in that direction. All indications from Washington now point to an imminent increase in the price of automobiles, and the result will be to take some of the pressure off suppliers, since the manufacturers will then be in a position to pay the higher costs required for parts. Just how long it will take to get this situation squared away is anyone's guess.

In spite of all difficulties, production is mounting. Chrysler Corp. currently is turning out in excess of 2500 vehicles a day including trucks, and schedules are geared to increases in the supply of components. Nash, Studebaker, and Hudson are climbing slowly but steadily as supplies increase and production processes smooth out. Packard is just resuming after being closed for lack of parts supplied by GM. It is true that there are occasional setbacks when some segment of the supply machine slips a cog, but the trend is ever upward. It will be slow for awhile, but the outlook now is brighter than it has been for some time.

As a result of the slow progress made to date on production and of the steadily mounting backlog of orders in dealers' hands, it now is becoming apparent that very few if any manufacturers will bring out their 1947 models until late this year or possibly early 1947, if then. The first official tipoff on this came from Jack Davis, Ford sales and advertising director, who stated recently that Ford does not expect to announce '47 models this year. Other companies have indicated unofficially that they will follow suit. The development is a natural and logical one. For one thing production by the time the normal changeover season arrives will at best be at the break-even point. Amortization of tools and dies would not be possible over the short production run up to then and there would be little opportunity to regain some of the unprecedented costs of reconversion. Consequently, the most sensible course would be to extend the model run to compensate for tooling costs. Another factor is that dealer relations would be strained if the factory were to shut down for 45 to 60 days for a changeover, while the dealers still have volume orders on their books for 1946 models. And most important of all, the normal incentive for changing models is non-existent—the need to stimulate sales.

An interesting case of the unusually heavy costs incurred in the present period is illustrated by the situation at Nash. Double crews are being used on one shift in order to train a second shift for production when the supply situation will justify two-shift operations. At that time, a third crew will be trained for use when around-the-clock operations can be carried on. Maintaining twice the number of required men during the training period is a heavy cost burden, but is necessary as part of the program for greatly expanded volume. Nash incidentally, also has purchased a former aviation plant at Los Angeles for an assembly plant. It will employ about 2500, and is expected to be ready for operation some time late this year.

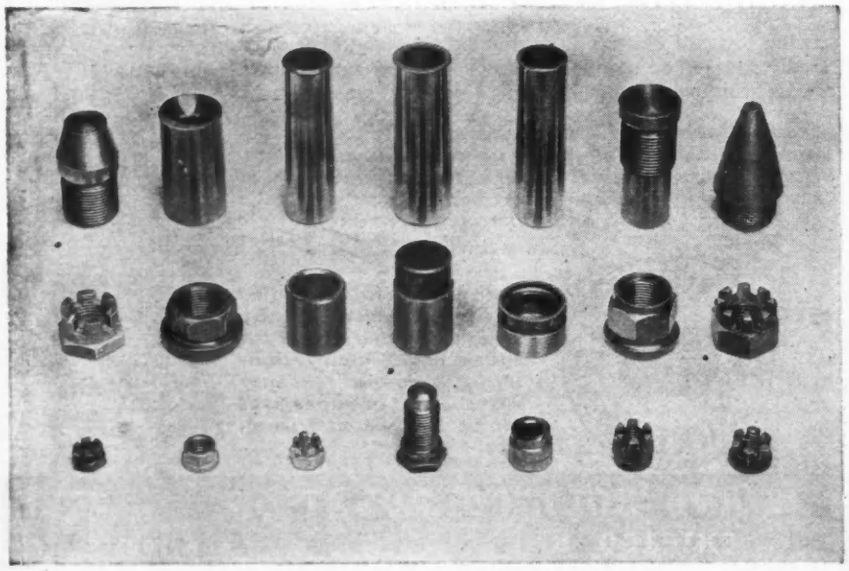


These are samples of precision parts (illustrated below) of ferrous and non-ferrous alloys that have been made by Bessemore. On each of them, the screw machine work was completed within ten and twenty-five seconds and .002" tolerances were maintained. The grinding work is held to .0001" (tenth).

PISTON PINS . . . Surface finish one to two micro inches . . . for passenger cars—trucks—tractors—marine and aircraft engines—gasoline and diesel type to your specifications.

BESSEMORE specializes in precision screw machine manufacture . . . making more of them better. Our engineers will be glad to make recommendations without obligation . . . send us your blueprints.

BESSEMORE PRODUCTS CO.
13243 East Warren Avenue
Detroit 13, Michigan



Eisemann Corp. to be Acquired by Jack & Heintz

Another step in the program for merger and broadening the scope of operations of Jack & Heintz Precision Industries, Inc., was made known with the announcement of plans to merge into that company Eisemann Corp. of Brooklyn, N. Y., manufacturers of magnetos and other products. Special meetings of the stockholders of both corporations to vote on the plan will be held on April 17.

The business of Eisemann Corp., which was established in 1904, is principally the production of the Eisemann magneto which is sold to manufacturers of internal combustion engines. The company also has two wholly owned subsidiaries, Sargent-Roundy Corp. and Standard Tool & Gage Co., Inc.